

# SIEMENS



SAX.., SAY..



SAX61.03/MO



SAV..



SAL..

## Acvatix™

## Actuators SAX.., SAY.., SAV.., SAL.. for valves

## Basic Documentation

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# 1 About this documentation

## 1.1 Navigation / Quick access

Information about a specific actuator is provided throughout the document. The structure of chapters 2 to 4 is as follows:

2 Engineering	<b>device oriented</b>
2.1 Product description	
2.2 Use	
3 Handling	<b>handling oriented</b>
3.1 Mounting and installation	
3.2 Commissioning and operation	
4 Functions and Control	<b>assembly oriented</b>
4.1 3-position control	
4.2 Modulating control	

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Quick access to important information including reference to pages:

Product no.	2 Engineering		3 Handling		4 Function and control		
	Equipment combinations	Accessories	Calibration	Accessories (mounting)	Control	Calibration	Accessories
SAX31.00	Page 14	Page 19	-	Page 36-43	Page 53-54	-	Page 75
SAX31.03			-		-		
SAX61.03 <sup>1)</sup>			Page 46		Page 56	Page 64	
SAX61.03/MO <sup>1)</sup>			-		-	-	
SAV61.00U <sup>1)</sup>			-		-	-	
SAX81.00 <sup>1)</sup>			-		-	-	
SAX81.03 <sup>1)</sup>			-		-	-	
SAX81.03U <sup>1)</sup>			-		-	-	
SAV31.00	Page 14	Page 19	-	Page 36-43	Page 53-54	-	Page 75
SAV61.00			Seite 46		Page 56	Page 64	
SAV61.00U			-		Page 53-54	-	
SAV81.00			-		-	-	
SAV81.00U			-		-	-	
SAL31.00T10	Page 14	Page 19	-	Page 36-43	Page 53-54	-	Page 75
SAL31.00T20			-		-		
SAL31.00T40			Page 46		Page 56	Page 64	
SAL31.03T10			-		-	-	
SAL61.00T10 <sup>1)</sup>			-		-	-	
SAL61.00T20 <sup>1)</sup>			-		-	-	
SAL61.00T40 <sup>1)</sup>			-		-	-	
SAL61.03T10 <sup>1)</sup>			-		-	-	
SAL81.00T10 <sup>1)</sup>			Page 53-54		-	-	
SAL81.00T20 <sup>1)</sup>			-		-	-	
SAL81.00T40 <sup>1)</sup>			-		-	-	
SAL81.03T10 <sup>1)</sup>			-		-	-	
SAY31P03	Page 14	Page 19	Page 46	Page 36-43	Page 53-54	Page 64	Page 75
SAY61P03			-		-		
SAY61.03U			-		-		
SAY81P03			-		-		
SAY81.03U			-		-		

<sup>1)</sup> These types of actuator are UL-listed versions

Note

Glossary and Index are arranged at the end of the document.

## 1.2 Revision history

Revision	Date	Changes	Chapter
First edition	16.07.2010	-	-
2.0	2010-12-12	Rotary actuator SAL..T10 integrated	
		Mounting and installation of butterfly valves and slipper valves corrected and expanded	3.1
		New chapter „Position feedback U“	4.6
		Technical data corrected	5
2.1	2011-09-14	V..F53.. valves added	2.5
		SAL.T20 rotary actuators added	1.1, 1.2, 2.3, 2.4, 2.5, 2.6, 3, 3.1, 4.12, 5, 7
3	2012-09-12	Corrections regarding SAX..Series „G“ “ VVF53.50-40K valve added	2.4, 4.1, 4.7, 4.13, 5, 6.4
3.1	2013-12-17	SAL..T40 is added	...
3.2	2014-11-20	Supplemented with new valves V..F22, V..F32.., V..F42..	1.1, 1.3, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 3.1, 4.1, 4.3, 4.4 4.13, 5, 6.1, 6.4, 7
		Supplemented with actuators SAV..	1.1, 1.3, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.8, 4.1, 4.4, 4.7, 4.13, 5, 6.4, 7
3.3	2015-10-26	Supplemented with actuators SAY..P..	Various
3.4	2016-10-04	Actualization of headings with SAY.., added SAY.. to information on content and accessories	Various
3.5	2017-05-26	New: Communicating actuators (SAX61.03/MO)	Whole document

## 1.3 Reference documents

Type of document	SAX..	SAV..	SAY..	SAL..	
Data Sheet	N4501, N4509, Q4501	N4503, N4510	A6V10628469	N4502	
Data Sheet Modbus communication profiles	A6V101037195	-	-	-	
Mounting Instructions	-	-	-	ASK31N: M4502.1 ASK33N: M4502.2 ASK35N: M4502.3	
	ASC.: M4040.1 ASZ7.5: M4040.2 AZX61.: M4040.3	ASK39.: M4040.3 ASZ6.6: M4501.1		-	
Mounting Instructions S..6../MO and G..161../MO	A5W00027551	-	-	-	
CE Declaration of Conformity	AC 230 V	T4501X1	T4503X1	A5W00000333	T4502X1
	AC/DC 24 V	T4501X2	T4503X2	A5W00000333	T4502X2
Environmental Declaration	E4501	E4503	7173310559B	E4502	
Environmental Declaration, external Modbus converter	A6V101083254	-	-	-	

## 1.4 Before you start

### 1.4.1 Trademarks

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The table below lists the third-party trademarks used in this document and their legal owners. The use of trademarks is subject to international and domestic provisions of the law.

Trademarks	Legal owner
Acvatix™	Siemens Switzerland Ltd

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- All necessary corrections are included in subsequent versions
- Anpassungen bzw. Documents are automatically amended as a consequence of modifications and corrections to the products described

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## 1.5 Scope of this documentation

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This document shall serve as a source of knowledge. In addition to basic information, it provides general technical information about the actuators used in HVAC plants. It is also targeted at engineering staff, HVAC electrical planners, system integrators and service engineers and provides all information required for planning work, correct installation, commissioning and service.

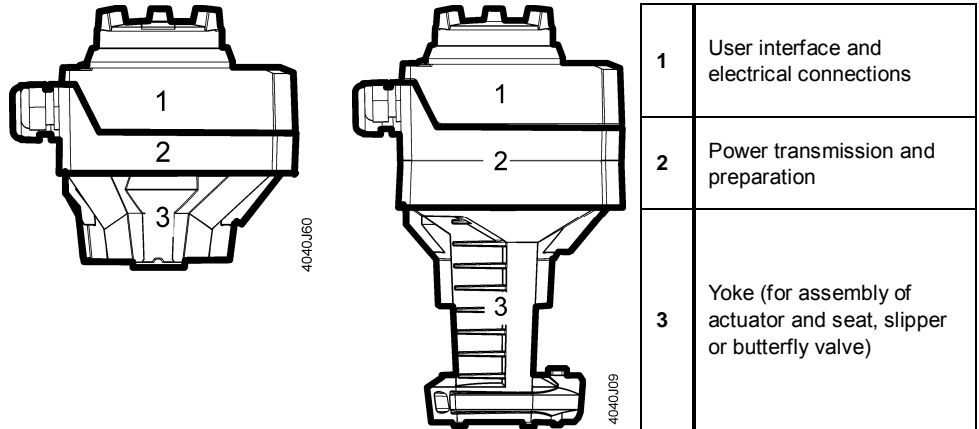


# 2 Engineering

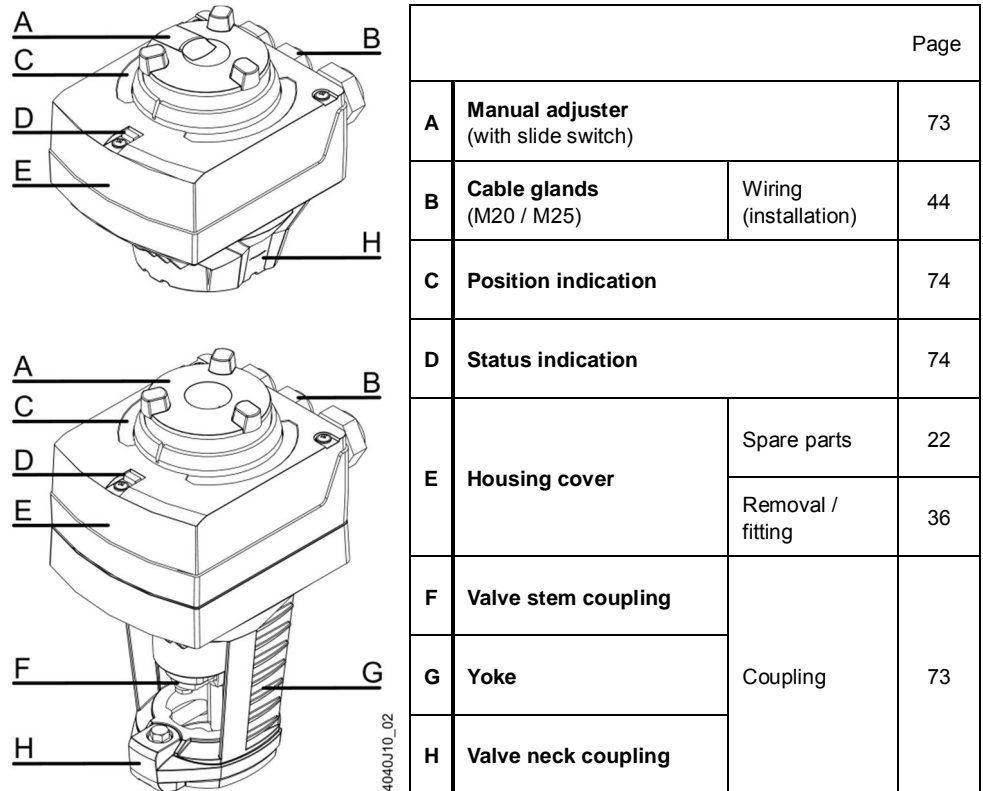
## 2.1 Product description

The line of large actuators is comprised of stroke actuators SAX., SAY., SAV.. and rotary actuators SAL..

### Mechanical design



### Components



### Network functions

See Section 3.2.2 Commissioning Modbus RTU

## 2.2 Use

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### **SAX.., SAV..**

For use in connection with Siemens 2-port or 3-port valves with 20/40 mm stroke, as control or shutoff valves for HVAC plants.

### **SAY..**

For the operation of Siemens combi valves of type VPI46.40F9.5Q and VPI46.50F12Q with 15 mm stroke as control valves in ventilation, air conditioning, and district heating systems.

### **SAL..**

For use in connection with Siemens butterfly or slipper valves, as control or shutoff valves for HVAC plants.

### Note

When using the actuators outdoors, weather shield ASK39.1 must be fitted. SAX61../MO is not suitable for outdoor applications.

## 2.3 Type summary

### 2.3.1 Stroke actuators

Product no.	Stock no.	Stroke	Pos. force	Operating voltage	Positioning signal	Spr. ret. time	Pos. time	LED	Manual adjuster	Extra functions		
<b>SAX31.00</b>	S55150-A105	20 mm	800 N	AC 230 V	3-position	-	120 s	-	Press and fix	-		
<b>SAX31.03</b>	S55150-A106						-	-				
<b>SAX61.03</b> <b>SAX61.03U</b>	S55150-A100 S55150-A100-A100			AC 24 V /DC 24 V	DC 0...10 V DC 4...20 mA 0...1000 Ω		Modbus RTU	30 s		✓	-	Position feedback, forced control, change of characteristic
<b>SAX61.03/MO</b> <sup>1)</sup>	S55150-A140											Position feedback, forced control
<b>SAX81.00</b>	S55150-A102			3-position	120 s		-	-				
<b>SAX81.03</b> <b>SAX81.03U</b>	S55150-A103 S55150-A103-A100				30 s		-	-				
<b>SAV31.00</b> <sup>2)</sup>	S55150-A112	40 mm	1600 N	AC 230 V	3-position	-	120 s	-	Press and fix	-		
<b>SAV61.00</b> <sup>2)</sup> <b>SAV61.00U</b> <sup>2)</sup>	S55150-A110 S55150-A110-A100							AC 24 V /DC 24 V		DC 0...10 V DC 4...20 mA 0...1000 Ω	3-position	✓
<b>SAV81.00</b> <sup>2)</sup> <b>SAV81.00U</b> <sup>2)</sup>	S55150-A111 S55150-A111-A100			3-position	-							

<sup>1)</sup> Fixed connection cable 5 x 0.75 mm<sup>2</sup>

<sup>2)</sup> SAV...: This product line of actuators might not be available in all countries. Please talk to your local contact or consult your local internet pages of [www.buildingtechnologies.siemens.com](http://www.buildingtechnologies.siemens.com).

## 2.3.2 Stroke actuators – combi valves

Product no.	Stock no.	Stroke	Pos. force	Operating voltage	Positioning signal	Spr. ret. time	Pos. time	LED	Manual adjuster	Extra functions
<b>SAY31P03</b>	S55150-A132	15 mm	500 N	AC 230 V	3-Point	-	30 s	-	Press and fix	-
<b>SAY61P03</b>	S55150-A133			AC 24 V /DC 24 V	DC 0...10 V DC 4...20 mA 0...1000 Ω			✓		Position feedback, forced control, change of characteristic
<b>SAY61.03U</b>	S55150-A135				3-Point			-		-
<b>SAY81P03</b>	S55150-A134									
<b>SAY81.03U</b>	S55150-A136									
<b>SAX31P03</b>	S55150-A118	20 mm	500 N	AC 230 V	3-position	-	30 s	-	Press and fix	-
<b>SAX61P03</b>	S55150-A114			AC 24 V /DC 24 V	DC 0...10 V DC 4...20 mA 0...1000 Ω			✓		Position feedback, forced control, change of characteristic
<b>SAX81P03</b>	S55150-A116				3-position			-		-
<b>SAV31P00</b>	S55150-A121	40 mm	1100 N	AC 230 V	3-position	-	120 s	-	Press and fix	-
<b>SAV61P00</b>	S55150-A119			AC 24 V /DC 24 V	DC 0...10 V DC 4...20 mA 0...1000 Ω			✓		Position feedback, forced control, change of characteristic
<b>SAV81P00</b>	S55150-A120				3-position			-		-

## 2.3.3 Rotary actuators

Product no.	Stock no.	Angular rotation	Torque	Operating voltage	Positioning signal	Spr. ret. time	Pos. time	LED	Manual adjuster	Extra functions								
<b>SAL31.00T10</b>	S55162-A108	90°	10 Nm	AC 230 V	3-position	-	120 s	-	Press and fix	-								
<b>SAL31.00T20</b>	S55162-A110		20 Nm															
<b>SAL31.00T40</b>	S55162-A111		40 Nm															
<b>SAL31.03T10</b>	S55162-A109		10 Nm															
<b>SAL61.00T10</b>	S55162-A100		10 Nm	AC 24 V /DC 24 V	DC 0...10 V DC 4...20 mA 0...1000 Ω		-	120 s		✓	Press and fix	Position feedback, forced control						
<b>SAL61.00T20</b>	S55162-A102		20 Nm															
<b>SAL61.00T40</b>	S55162-A103		40 Nm															
<b>SAL61.03T10</b>	S55162-A101		10 Nm															
<b>SAL81.00T10</b>	S55162-A104		10 Nm										3-position	-	120 s	-	Press and fix	-
<b>SAL81.00T20</b>	S55162-A106		20 Nm															
<b>SAL81.00T40</b>	S55162-A107		40 Nm															
<b>SAL81.03T10</b>	S55162-A105		10 Nm															

## 2.4 Ordering

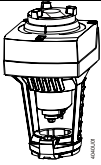
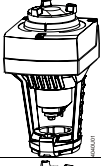
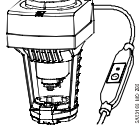
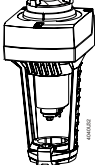

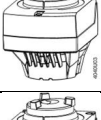





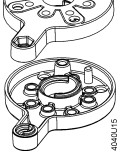



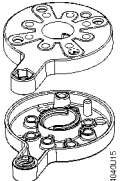
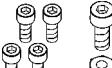


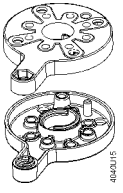
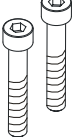
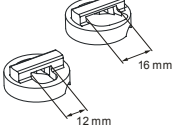
Example

Product no.	Stock no.	Description	Quantity
SAX81.03	S55150-A103	Actuator	1
ASZ7.5	S55845-Z106	Potentiometer	1

Delivery

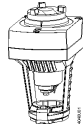
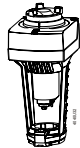




Actuators, valves and accessories are supplied in individual packs.

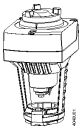
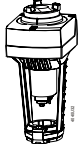








Scope of delivery


Type	Device	Screws	Waveinset
SAY..P..		-	-
SAX..		-	-
SAX../MO		-	-
SAV..		-	-
SAL..T10		-	-
SAL..T20		2 pcs. M5 x 20 mm 	1 pc. 11 mm 
SAL..T40		2 pcs. M6 x 20 mm 	1 pc. 14 mm 
ASK31N		4 pcs. M6 x 16 mm 1 pc. M5 x 20 mm incl. nut 	1 pc. 12 mm  4040U17  1 pc. 12 mm  4040U18
ASK33N		4 pcs. M6 x 16 mm 1 pc. M5 x 20 mm incl. nut 	1 pc. 12 mm  4040U17  1 pc. 12 mm  4040U18
ASK35N		2 pcs. M8 x 50 mm 1 pc. M5 x 20 mm incl. nut  4040U19	1 pc. 12 mm 1 pc. 16 mm  16 mm 12 mm

## 2.5 Equipment combinations

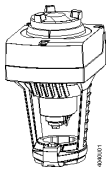
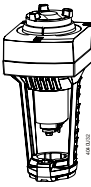




### 2.5.1 Stroke actuators – 3-port valves

Typical applications	Stroke actuators	Data Sheet	Stroke		20 mm	40 mm
			Positioning force		800 N	1600 N
<ul style="list-style-type: none"> <li>• Heating plants</li> <li>• Ventilation and air conditioning plants</li> <li>• Heat generation</li> <li>• Heat distribution</li> <li>• District heating plants</li> </ul>	SAX.. <sup>8)</sup> SAV.. <sup>8)</sup>	N4501 N4503				
					SAX..	SAV..
Valves	Basic Doc. (P4030)				$\Delta p_{\max}^{5)}$ [kPa] AB→A B	$\Delta p_{\max}^{5)}$ [kPa] A→AB B
Valves	Data Sheet	Valve type	DN	$k_{vs}$ [m <sup>3</sup> /h]		
<b>PN6</b>  -10... 130 °C <sup>4)</sup>	N4410	VXF21.22...25 <sup>1) 7)</sup>	25	1.9 / 3 / 5 / 7.5	100	300
		VXF21.25... <sup>2) 7)</sup>	25	2.5 / 4 / 6.3 / 10		
		VXF21.39-40 <sup>7)</sup>	40	12 / 19		
		VXF21.40... <sup>2) 7)</sup>	40	16 / 25		
		VXF21.50 <sup>7)</sup>	50	31	60	175
		VXF21.50-40 <sup>7)</sup>	50	40		
		VXF21.65 <sup>7)</sup>	65	49		
		VXF21.65-63 <sup>7)</sup>	65	63		
VXF21.80-78 <sup>7)</sup>	80	78	40	100		
VXF21.80-100 <sup>7)</sup>	80	100				
<b>PN6</b> -10... 130 °C	N4401	VXF22.25... <sup>2)</sup>	25	2.5 / 4 / 6.3 / 10	100	300
		VXF22.40... <sup>2)</sup>	40	16 / 25		
		VXF22.50-40	50	40		
		VXF22.65-63	65	63	50	150
		VXF22.80-100	80	100		
		VXF22.100-160	100	160	-	-
<b>PN10</b>  -10... 130 °C <sup>4)</sup>	N4420	VXF31.15... <sup>2) 7)</sup>	15	2.5 / 4	100	300
		VXF31.24...25 <sup>1) 7)</sup>	25	5 / 7.5		
		VXF31.25... <sup>2) 7)</sup>	25	6.3 / 10		
		VXF31.39...40 <sup>1) 7)</sup>	40	12 / 19		
		VXF31.40... <sup>2) 7)</sup>	40	16 / 25	60	175
		VXF31.50 <sup>7)</sup>	50	31		
		VXF31.50-40 <sup>7)</sup>	50	40		
		VXF31.65 <sup>7)</sup>	65	49		
		VXF31.65-63 <sup>7)</sup>	65	63	40	100
		VXF31.80 <sup>7)</sup>	80	78		
VXF31.80-100 <sup>7)</sup>	80	100				
<b>PN 10</b> -10... 130 °C <sup>4)</sup>	N4402	VXF32.15... <sup>2)</sup>	15	1.6 / 2.5	100	400
		VXF32.25... <sup>2)</sup>	25	6.3 / 10		
		VXF32.40... <sup>2)</sup>	40	16 / 25		
		VXF32.50-40	50	40	50	150
		VXF32.65-63	65	63		
		VXF32.80-100	80	100	-	-
		VXF32.100-160	100	160		
		VXF32.125-250	125	250	50	225
VXF32.150-400	150	400				
<b>PN16</b>  -10... 130 °C <sup>4)</sup>	N4430	VXF40.15... <sup>2) 7)</sup>	15	1.9 / 2.5 / 3 / 4	100	300
		VXF40.25... <sup>2) 7)</sup>	20	5 / 6.3 / 7.5 / 10		
		VXF40.40... <sup>2) 7)</sup>	40	12 / 16 / 19 / 25		
		VXF40.50... <sup>2) 7)</sup>	50	31 / 40	60	175
		VXF40.65... <sup>2) 7)</sup>	65	49 / 63		
		VXF40.80... <sup>2) 7)</sup>	80	78 / 100	40	100
<b>PN16</b>  -10... 130 °C <sup>4)</sup>	N4440	VXF41.14...15 <sup>1) 7)</sup>	15	1.9 / 3	200	800
		VXF41.24...25 <sup>1) 7)</sup>	25	5 / 7.5		
		VXF41.39...40 <sup>1) 7)</sup>	40	12 / 19	150	500
		VXF41.49...50 <sup>1) 7)</sup>	50	19 / 31	100	350

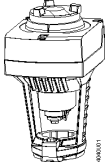
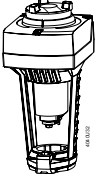






Typical applications	Stroke actuators	Data Sheet	Stroke		20 mm	40 mm				
			Positioning force	800 N	1600 N					
<ul style="list-style-type: none"> <li>• Heating plants</li> <li>• Ventilation and air conditioning plants</li> <li>• Heat generation</li> <li>• Heat distribution</li> <li>• District heating plants</li> </ul>	SAX.. SAV.. <sup>8)</sup>	N4501 N4503								
					SAX..	SAV..				
Valves	Basic Doc. (P4030)				$\Delta p_{max}^{5)}$ [kPa] 	$\Delta p_{max}^{5)}$ [kPa] 	$\Delta p_{max}^{5)}$ [kPa] 	$\Delta p_{max}^{5)}$ [kPa] 		
Valves	Data Sheet	Valve type	DN	$k_{vs}$ [m <sup>3</sup> /h]						
<b>PN16</b>   -10...130 °C <sup>4)</sup>	N4403	VXF42.15-.. <sup>2)</sup>	15	1.6 / 2.5 / 4	100	400	-	-		
		VXF42.20-6.3	20	6.3						
		VXF42.25-.. <sup>2)</sup>	25	6.3 / 10						
		VXF42.40-.. <sup>2)</sup>	40	16 / 25	50	31.5 / 40	100	400	-	
		VXF42.50-.. <sup>2)</sup>	50	31.5 / 40						
		VXF42.65-.. <sup>2)</sup>	65	50 / 63						
		VXF42.80-.. <sup>2)</sup>	80	80 / 100	-	-	50	-	225	
		VXF42.100-.. <sup>2)</sup>	100	125 / 160						
		VXF42.125-.. <sup>2)</sup>	125	200 / 250						
VXF42.150-.. <sup>2)</sup>	150	315 / 400					90			
								60		
<b>PN16</b>   -20...130 °C <sup>4)</sup>	N4404	VXF43.65-63	65	63	-	-	100	400		
		VXF43.80-100	80	100						
		VXF43.100-160	100	160						
		VXF43.125-250	125	250						
		VXF43.150-400	150	400						
<b>PN25/16</b> <sup>6)</sup>   -20...130 °C <sup>4)</sup>	N4405	VXF53.15-.. <sup>2)</sup>	15	1.6 / 2.5 / 4	200	1200	-	-		
		VXF53.20-6.3	20	6.3						
		VXF53.25-.. <sup>2)</sup>	25	6.3 / 10						
		VXF53.32-16	32	16						
		VXF53.40-.. <sup>2)</sup>	40	16 / 25	100	300	200	1150		
		VXF53.50-40	50	40						
		<b>PN25</b> <sup>6)</sup>  -20...130 °C <sup>4)</sup>		VXF53.65-63	65	63	-	-	100	400
				VXF53.80-100	80	100				
				VXF53.100-160	100	160				
				VXF53.125-250	125	250				
VXF53.150-400	150			400						
<b>PN16</b>   -25...130 °C <sup>4)</sup>	N4463	-	VXG41.1301 <sup>3)</sup>	15	1.6	-	800	-		
		-	VXG41.1401 <sup>3)</sup>	15	2.5					
		VXG41.15	VXG41.1501 <sup>3)</sup>	15	4					
		VXG41.20	VXG41.2001 <sup>3)</sup>	20	6.3					
		VXG41.25	VXG41.2501 <sup>3)</sup>	25	10					
		VXG41.32	VXG41.3201 <sup>3)</sup>	32	16					
		VXG41.40	VXG41.4001 <sup>3)</sup>	40	25					
		VXG41.50	VXG41.5001 <sup>3)</sup>	50	40					
						300				

- 1) Insert running number instead of  $k_{vs}$  value
- 2) .. = insert  $k_{vs}$  value
- 3) With tight bypass; VXG41.1301 and VXG41.1401: use only SAX61..., SKD32.50 or SKD82.50.
- 4) For media temperatures > 130 °C use electrohydraulic actuators SKD.. (N4561), SKB.. (N4564).
- 5)  $\Delta p_{max}^{5)}$   = max. permissible differential pressure in diverting mode
- 6) DN 15...50: Flange dimensions for PN 16 and PN 25  
DN 65...150: Flange dimensions only for PN 25
- 7) Valves no longer in the active sale
- 8) SAV..: This product line of actuators might not be available in all countries. Please talk to your local contact or consult your local internet pages of [www.buildingtechnologies.siemens.com](http://www.buildingtechnologies.siemens.com).

## 2.5.2 Stroke actuators – 2-port valves

Typical applications	Stroke actuators	Data Sheet	Stroke		20 mm		40°mm	
			Positioning force		800 N		1600 N	
<ul style="list-style-type: none"> <li>• Heating plants</li> <li>• Ventilation and air conditioning plants</li> <li>• Heat generation</li> <li>• Heat distribution</li> <li>• District heating plants</li> </ul>	SAX.. SAV.. <sup>5)</sup>	N4501 N4503						
					SAX..		SAV..	
<b>Valves</b>	<b>Basic Doc. (P4030)</b>			$\Delta p_s$	$\Delta p_{max}$	$\Delta p_s$	$\Delta p_{max}$	
<b>Valves</b>	<b>Data Sheet</b>	<b>Valve type</b>	<b>DN</b>	<b><math>k_{vs}</math> [m<sup>3</sup>/h]</b>	<b><math>\Delta p_s</math> [kPa]</b>	<b><math>\Delta p_{max}</math> [kPa]</b>	<b><math>\Delta p_s</math> [kPa]</b>	<b><math>\Delta p_{max}</math> [kPa]</b>
<b>PN6</b>  -10...130 °C <sup>3)</sup>	N4310	VVF21.22...25 <sup>1) 4)</sup>	25	1.9 / 3 / 5 / 7,5	600	300	-	-
		VVF21.25... <sup>2) 4)</sup>	25	2.5 / 4 / 6.3 / 10				
		VVF21.39...40 <sup>1) 4)</sup>	40	12 / 19	500			
		VVF21.40... <sup>2) 4)</sup>	40	16 / 25				
		VVF21.50 <sup>4)</sup>	50	31	300			
		VVF21.50-40 <sup>4)</sup>	50	40				
		VVF21.65 <sup>4)</sup>	65	49	175	175		
		VVF21.65-63 <sup>4)</sup>	65	63				
VVF21.80-78 <sup>4)</sup>	80	78	100	100				
VVF21.80-100 <sup>4)</sup>	80	100						
<b>PN6</b> -10...130 °C	N4401	VVF22.25... <sup>2)</sup>	25	2.5 / 4 / 6.3 / 10	600	300	-	-
		VVF22.40... <sup>2)</sup>	40	16 / 25	550			
		VVF22.50-40	50	40	350	600	300	
		VVF22.65-63	65	63	200	150	450	
		VVF22.80-100 <sup>1)</sup>	80	100	125	75	250	225
		VVF22.100-160 <sup>1)</sup>	100	160	-	-	160	160
<b>PN10</b>  -10...130 °C <sup>3)</sup>	N4320	VVF31.15... <sup>2) 4)</sup>	15	2.5 / 4	1000	300	-	-
		VVF31.24...25 <sup>1) 4)</sup>	25	5 / 7,5				
		VVF31.25... <sup>2) 4)</sup>	25	6.3 / 10	525			
		VVF31.39...40 <sup>1) 4)</sup>	40	12 / 19				
		VVF31.40... <sup>2) 4)</sup>	40	16 / 25	325			
		VVF31.50 <sup>4)</sup>	50	31				
		VVF31.50-40 <sup>4)</sup>	50	40	175	175		
		VVF31.65 <sup>4)</sup>	65	49				
		VVF31.65-63 <sup>4)</sup>	65	63	100	100		
		VVF31.80 <sup>4)</sup>	80	78				
VVF31.80-100 <sup>4)</sup>	80	100						
<b>PN10</b> -10...130 °C <sup>4)</sup>	N4402	VVF32.15... <sup>2)</sup>	15	1.6 / 2.5 / 4	1000	400	-	-
		VVF32.25... <sup>2)</sup>	25	6.3 / 10				
		VVF32.40... <sup>2)</sup>	40	16 / 25	550	1000	400	
		VVF32.50-40	50	40	350	300		
		VVF32.65-63	65	63	200	150	450	
		VVF32.80-100 <sup>2)</sup>	80	100	125	75	250	225
		VVF32.100-160 <sup>2)</sup>	100	160	-	-	160	125
		VVF32.125-250	125	250			125	90
		VVF32.150-400 <sup>2)</sup>	150	400			80	80
<b>PN16</b>  -10...130 °C <sup>3)</sup>	N4330	VVF40.15... <sup>2) 4)</sup>	15	1.9 / 2.5 / 3 / 4	1600	300	-	-
		VVF40.25... <sup>2) 4)</sup>	20	5 / 6.3 / 7.5 / 10	1550			
		VVF40.40... <sup>2) 4)</sup>	40	12 / 16 / 19 / 25	525			
		VVF40.50... <sup>2) 4)</sup>	50	31 / 40	325			
		VVF40.65... <sup>2) 4)</sup>	65	49 / 63	175	175		
		VVF40.80... <sup>2) 4)</sup>	80	78 / 100	100	100		
<b>PN16</b>  -10...130 °C <sup>3)</sup>	N4340	VVF41.49 <sup>4)</sup>	50	19	350	300	-	-
		VVF41.50 <sup>4)</sup>	50	31				
		-	-	-	-	-		



Typical applications	Stroke actuators	Data Sheet	Stroke		20 mm		40° mm					
			Positioning force		800 N		1600 N					
<ul style="list-style-type: none"> <li>• Heating plants</li> <li>• Ventilation and air conditioning plants</li> <li>• Heat generation</li> <li>• Heat distribution</li> <li>• District heating plants</li> </ul>	SAX.. SAV.. <sup>5)</sup>	N4501 N4503										
									SAX..		SAV..	
<b>Valves</b>	<b>Basic Doc. (P4030)</b>				$\Delta p_s$	$\Delta p_{max}$	$\Delta p_s$	$\Delta p_{max}$				
<b>Valves</b>	<b>Data Sheet</b>	<b>Valve type</b>	<b>DN</b>	<b><math>k_{vs}</math> [m<sup>3</sup>/h]</b>	<b>[kPa]</b>	<b>[kPa]</b>	<b>[kPa]</b>	<b>[kPa]</b>				
<b>PN16</b>  -10...130 °C <sup>3)</sup>	N4403	VVF42.15-.. <sup>2)</sup>	15	1,6 / 2,5 / 4	1600	400	-	-				
		VVF42.20-6.3	20	6,3								
		VVF42.25-.. <sup>2)</sup>	25	6,3 / 10								
		VVF42.32-16	32	16	900	-	-	-	-			
		VVF42.40-.. <sup>2)</sup>	40	16 / 25	550							
		VVF42.50-.. <sup>2)</sup>	50	31,5 / 40	350					300	1250	400
		VVF42.65-.. <sup>2)</sup>	65	50 / 63	200					150	750	
		VVF42.80-.. <sup>2)</sup>	80	80 / 100	125					75	450	
		VVF42.100-.. <sup>2)</sup>	100	125 / 160	-					-	250	160
		VVF42.125-.. <sup>2)</sup>	125	200 / 250	-	-	125	125				
VVF42.150-.. <sup>2)</sup>	150	315 / 400	-	-	80	80						
<b>PN16</b>  -10...130 °C <sup>3)</sup>	N4403	VVF42.50-40K	50	40	1600	400	-	-				
		VVF42.65-63K	65	63								
		VVF42.80-100K	80	100								
		VVF42.100-160K	100	160	-	-	1600	400				
		VVF42.125-250K	125	250	-	-	1400					
		VVF42.150-360K	150	360	-	-	-					
<b>PN16</b>  20...130 °C <sup>3)</sup>	N4404	VVF43.65-.. <sup>2)</sup>	65	50 / 63	-	-	-	-				
		VVF43.80-.. <sup>2)</sup>	80	80 / 100								
		VVF43.100-.. <sup>2)</sup>	100	125 / 160								
		VVF43.125-.. <sup>2)</sup>	125	200 / 250								
		VVF43.150-.. <sup>2)</sup>	150	315 / 400								
<b>PN25</b>  -20...130 °C <sup>3)</sup>	N4373	VVF52.15-.. <sup>2) 4)</sup>	15	0.16 / 0.2 / 0.25 / 0.32 / 0.4 / 0.5 0.63 / 0.8 / 1 / 1.25 / 1.6 / 2 / 2.5 / 3.2 / 4	2500	1600	-	-				
		VVF52.25-.. <sup>2) 4)</sup>	25	5 / 6.3 / 8 / 10	1500	1200	-	-				
		VVF52.40-.. <sup>2) 4)</sup>	40	12.5 / 16 / 20 / 25	500	400	-	-				
<b>PN25/16</b>  -20...130 °C <sup>3)</sup>	N4405	VVF53.15-.. <sup>2)</sup>	15	0.16 / 0,2 / 0.25 / 0.32 / 0,4 / 0.5 / 0.63 / 0,8 / 1 / 1.25 / 1.6 / 2 / 2.5 / 3.2 / 4	2500	1200	-	-				
		VVF53.20-6.3	20	6.3								
		VVF53.25-.. <sup>2)</sup>	25	5 / 6.3 / 8 / 10								
		VVF53.32-16	32	16	900	750	-	-				
		VVF53.40-.. <sup>2)</sup>	40	12.5 / 16 / 20 / 25	550	500			1250	1150		
		VVF53.50-.. <sup>2)</sup>	50	31.5 / 40	350	300			750	700		
		VVF53.65-63 <sup>3)</sup>	65	63	-	-			450	400		
		VVF53.80-100 <sup>3)</sup>	80	100	-	-			250	225		
		VVF53.100-160	100	160	-	-			160	125		
		VVF53.125-250	125	250	-	-	125	90				
VVF53.150-360	150	360	-	-	80	60						
<b>PN16</b>  -25...130 °C <sup>3)</sup>	N4363	VVG41.11...12 <sup>1)</sup>	15	0.63 / 1	1600	800	-	-				
		VVG41.13	15	1.6								
		VVG41.14	15	2.5								
		VVG41.15	15	4	-	-						
		VVG41.20	20	6.3								
		VVG41.25	25	10			1550					
		VVG41.32	32	16			875					
		VVG41.40	40	25			525	525				
		VVG41.50	50	40			300	300				

<sup>1)</sup> insert running number instead of  $k_{vs}$  value

<sup>2)</sup> .. = insert  $k_{vs}$  value

<sup>3)</sup> For media temperatures > 130 °C use electrohydraulic actuators SKD.. (N4561), SKB.. (N4564).

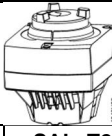

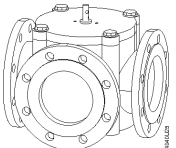

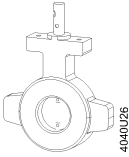

<sup>4)</sup> valves no longer in the active sale

<sup>5)</sup> SAV..: This product line of actuators might not be available in all countries. Please talk to your local contact or consult your local internet pages of [www.buildingtechnologies.siemens.com](http://www.buildingtechnologies.siemens.com)

## 2.5.3 Stroke Actuators – combi valves

	Valves				Actuators					
	Standard flow rate	High flow rate	DN	H <sub>100</sub> [mm]	SAY..P.		SAX..P.		SAV..P.	
					Δp <sub>max</sub> [kPa]	Δp <sub>s</sub> [kPa]	Δp <sub>max</sub> [kPa]	Δp <sub>s</sub> [kPa]	Δp <sub>max</sub> [kPa]	Δp <sub>s</sub> [kPa]
PN25 N4855	VPI46.40F9.5Q	-	40	15	400	400	-	-	-	-
	VPI46.50F12Q	-	50							
PN16 N4315	VPF43.50F16	VPF43.50F25	50	20	-	-	600	600	-	-
	VPF43.65F24	VPF43.65F35	65							
	VPF43.80F35	VPF43.80F45	80							
	VPF43.100F70	VPF43.100F90	100	40	-	-	-	-	600	600
	VPF43.125F110	VPF43.125F135	125							
VPF43.150F160	VPF43.150F200	150	43							
PN25 N4315	VPF53.50F16	VPF53.50F25	50	20	-	-	600	600	-	-
	VPF53.65F24	VPF53.65F35	65							
	VPF53.80F35	VPF53.80F45	80							
	VPF53.100F70	VPF53.100F90	100	40	-	-	-	-	600	600
	VPF53.125F110	VPF53.125F135	125							
VPF53.150F160	VPF53.150F200	150	43							

## 2.5.4 Rotary actuators – slipper and butterfly valves

Typical applications	Rotary actuators	Data Sheet	Angular rotation			90°						
			Torque			10 Nm	20 Nm	40 Nm				
<ul style="list-style-type: none"> <li>• Heating plants</li> <li>• Ventilation and air conditioning plants</li> <li>• Heat generation</li> <li>• Heat distribution</li> <li>• District heating plants</li> </ul>	SAL..	N4502										
									SAL..T10	SAL..T20	SAL..T40	
Slipper valves	Data Sheet	Valve type	DN	k <sub>vs</sub> [m <sup>3</sup> /h]	Mounting set	Δp <sub>max</sub> [kPa]						
  1 °C...120 °C	N4241	VBF21.40	40	25	-	30	-	-	-			
		VBF21.50	50	40	-							
		VBF21.65	65	63	ASK31N							
		VBF21.80	80	100	ASK31N							
		VBF21.100	100	160	ASK31N							
		VBF21.125	125	550	ASK31N							
		VBF21.150	150	820	ASK31N							
Butterfly valves						Δp <sub>s</sub> [kPa]						
  -10 °C...120 °C	N4131	VKF41.40 <sup>2)</sup>	40	50	ASK33N	500	-	-	-			
		VKF41.50 <sup>2)</sup>	50	80	ASK33N							
		VKF41.65 <sup>2)</sup>	65	200	ASK33N							
		VKF41.80 <sup>2)</sup>	80	400	ASK33N							
		VKF41.100 <sup>2)</sup>	100	760	ASK33N							
		VKF41.125 <sup>2)</sup>	125	1000	ASK33N							
		VKF41.150 <sup>3)</sup>	150	2100	ASK33N					250	-	400
		VKF41.200 <sup>3)</sup>	200	4000	ASK33N					125	-	300
 -10 °C...120 °C	N4136	VKF46.40 <sup>4)</sup>	40	50	-	-	1600	-	-			
		VKF46.50 <sup>4)</sup>	50	85	-							
		VKF46.65 <sup>4)</sup>	65	215	-							
		VKF46.80 <sup>4)</sup>	80	420	-							
		VKF46.100 <sup>4)</sup>	100	800	-					-	1600	
		VKF46.125 <sup>4)</sup>	125	1010	-					-	1200	

1) SAL..T10 rotary actuators only fit on VBF21..., DN65...150. For VBF21..., DN40/50 use SQK34..., SQK84... or SQK33.00 rotary actuators.

2) VKF41.. maximum flow speed with SAL.T10 actuator with water DN40.. DN125 = 4 m/

3) VKF41.. maximum flow speed with SAL.T0 actuator with water DN150/200 = 2.5 m/s, with SAL.T40 actuator with water DN150/200 = 4 m/s

4) VKF46.. maximum flow speed water = 4.5 m/s, air 40 m/s

## 2.6 Accessories

### 2.6.1 Electrical accessories

Product no.	Auxiliary switch ASC10.51	Potentiometer ASZ7.5/.. <sup>1)</sup>	Function module AZX61.1	Stem heating element ASZ6.6
Stock no.	S55845-Z103	S55845-Z106	S55845-Z107	S55845-Z108
		Max. 2		Max. 1
SAX31..	Max. 2	Max. 1	-	Max. 1
SAX61..		-	Max. 1	
SAX61.03/MO		-	-	
SAX81..		Max. 1	-	
SAX31P..	Max. 2	Max. 1	-	-
SAX61P..		-	Max. 1	
SAX81P..		Max. 1	-	
SAV31..	Max. 2	Max. 1	-	Max. 1
SAV61..		-	Max. 1	
SAV81..		Max. 1	-	
SAV31P..	Max. 2	Max. 1	-	-
SAV61P..		-	Max. 1	
SAV81P..		Max. 1	-	
SAL31..	Max. 2	Max. 1	-	-
SAL61..		-	Max. 1	
SAL81..		Max. 1	-	
SAY31P..	Max. 2	Max. 1	-	-
SAY61P..		-	Max. 1	
SAY81P..		Max. 1	-	

Note: ASZ7.5

For the combination SIMATIC S5/S7 and position feedback message, we recommend actuators with DC 0...9.8 V feedback signals.

The signal peaks that occur in the potentiometer ASZ7.5 may result in error messages on Siemens SIMATIC.  
This is not the case when combined with Siemens HVAC controllers.  
The reason is that SIMATIC has a higher resolution and faster response time.

### 2.6.2 Mechanical accessories

Product no.	Weather shield ASK39.1 <sup>1)</sup>	Mounting set		
		ASK31N for VBF21..	ASK33N for VKF41..	ASK35N für VKF45.. <sup>2)</sup>
Stock no.	S55845-Z109	S55845-Z100	S55845-Z101	S55845-Z102
SAY..	Max. 1			
SAX..		-	-	-
SAV..				
SAL..				
SAL..T10	Max. 1	✓	✓	-
SAL..T20		-	-	DN40...DN65
SAL..T40		-	DN150 / 200	DN80...DN200

<sup>1)</sup> SAX61../MO is not suitable for outdoor applications.

<sup>2)</sup> In 2000 VKF45.. line was replaced by VKF46.. line.

## 2.7 Product replacements

Replacement of SQX.. / SQL.. actuators by SAX.. / SAL.. actuators.

Note

- When replacing actuators consider positioning force, torque and positioning times.
- Adjust in the controller the parameter "Running time" respectively "Positioning time", to ensure stable control.
- The replacement of accessory items needs to be taken into consideration also. In that case, compatibility is not necessarily ensured.

### 2.7.1 Stroke actuators SQX.. to SAX..

SQX..		Pos. time [s]	Pos. force [N]	SAX.. <sup>1)</sup>		VVF21../VXF21.. VVF31../VXF31.. VVF40../VXF40..	VVF41../VXF41.. VVG41../VXG41..	VVF51.. VVF52..
				Pos. time [s]	Pos. force [N]			
						DN15...80	DN15...50	DN15...40
SQX31.. <sup>2)</sup>	SQX31.00	150	500	SAX31.00	120	800	✓	✓
	SQX31.03	35	500	SAX31.03	30	800	✓	✓
SQX61..	SQX61	35	500	SAX61.03	30	800	✓	✓
	SQX61U	35	500	SAX61.03U	30	800	✓	✓
SQX81..	SQX81.00	150	500	SAX81.00	120	800	✓	✓
	SQX81.00U	150	500	SAX81.00U	120	800	✓	✓
	SQX81.03	35	500	SAX81.03	30	800	✓	✓
	SQX81.03U	35	500	SAX81.03U	30	800	✓	✓
SQX32..	SQX32.00	150	700	SAX31.00	120	800	✓	✓
	SQX32.03	35	700	SAX31.03	30	800	✓	✓
SQX62..	SQX62	35	700	SAX61.03	30	800	✓	✓
	SQX62U	35	700	SAX61.03U	30	800	✓	✓
SQX82..	SQX82.00	150	700	SAX81.00	120	800	✓	✓
	SQX82.00U	150	700	SAX81.00U	120	800	✓	✓
	SQX82.03	35	700	SAX81.03	30	800	✓	✓
	SQX82.03U	35	700	SAX81.03U	30	800	✓	✓

<sup>1)</sup> SAX81.., SAX61.. are available as UL-listed versions.

<sup>2)</sup> SQX31.06: Actuator for gas valves. Either replace complete valve-actuator combination or clarify required positioning time and replace only actuator. Consider if mounting set is required.

### 2.7.2 Rotary actuators SQL.. to SAL..

SQL..		Pos. time [s]	Torque [Nm]	SAL..		
				Pos. time [s]	Torque [Nm]	
SQL31..	SQL31.10	120	12,5	SAL31.00T10	120	10
SQL32..	SQL32.10	125	12,5	SAL31.00T10	120	10
	SQL32.12	70	12,5	SAL31.00T10 or SAL31.03T10 <sup>1)</sup>	120	10
	SQL32.13	30	5	SAL31.03T10	30	10
SQL33..	SQL33.00	125	12,5	SAL31.00T10	120	10
	SQL33.03	30	10	SAL31.03T10	30	10
SQL83..	SQL83.00	125	12,5	SAL81.00T10	120	10
	SQL83.04	30	10	SAL81.03T10	30	10
SQL35..	SQL35.00	125	20	SAL31.00T20 <sup>2)</sup>	120	20
	SQL35.00	125	20	SAL31.00T40 <sup>2)</sup>	120	40
SQL85..	SQL85.00	125	20	SAL81.00T20 <sup>2)</sup>	120	20
	SQL85.00	125	20	SAL81.00T40 <sup>2)</sup>	120	40

<sup>1)</sup> SAL.. positioning time differs from that of SQL32.12 and SQL32.13 rotary actuators. Consider positioning time when replacing.

<sup>2)</sup> use SAL.T20 on VKF46.40, VKF46.50 and VKF46.65  
use SAL.T40 on VKF46.80, VKF46.100 and VKF46.125

Rotary actuators		SQL..				SAL..			
		SQL31..	SQL32..	SQL33.. SQL83..	SQL35.. SQL85..	SAL31.00T10 SAL31.03T10 SAL81.00T10 SAL81.03T10	SAL31.00T20 SAL81.00T20	SAL31.00T40 SAL81.00T40	
VBF21..	DN 40 / DN 50 <sup>1)</sup>	-	-	ASK32	-	- <sup>1)</sup>	- <sup>1)</sup>	- <sup>1)</sup>	
	DN 65...150	-	-	ASK31	-	<b>ASK31N</b>	-	-	
VBF31..	DN 40 / DN 50 <sup>2)</sup>	-	-	ASK32	-	- <sup>2)</sup>	- <sup>2)</sup>	- <sup>2)</sup>	
	DN 65...100	-	-	ASK31	-	<b>ASK31N</b>	-	-	
B3f..	DN 40 / DN 50 <sup>2)</sup>	Direct	ASK25	ASK31	-	-	-	-	
	DN 65...150	Direct	ASK25	ASK31	-	<b>ASK31N</b>	-	-	
C1f..	DN 40 / DN 50 <sup>2)</sup>	Direct	-	ASK31	-	-	-	-	
	DN 65...100	Direct	-	ASK31	-	<b>ASK31N</b>	-	-	
K1i..	DN 20...32	Direct	ASK24	ASK33	-	<b>ASK33N</b>	-	-	
K1f..	DN 40...200	Direct	ASK24	ASK33	-	<b>ASK33N</b>	-	-	
VKF41..	DN 40...125	-	-	ASK33	-	<b>ASK33N</b>	-	-	
	DN 150 / DN 200	-	-	ASK33	ASK35	<b>ASK33N</b>	-	<b>ASK33N</b>	
VKF45..	DN40...65	-	-	-	ASK35	-	<b>ASK35N</b>	<b>ASK35N</b>	
	DN80...200	-	-	-	-	-	-	<b>ASK35N</b>	

<sup>1)</sup> Replace with rotary actuators SQK34.., SQK84.. (data sheet N4508) or SQK33.00 (data sheet N4506).

<sup>2)</sup> Replace with rotary actuators SQK33.00 + ASK32

Note

**D** Rotary actuators SAL.. are not suited for mounting sets ASK24, ASK25, ASK31, ASK32, ASK33, ASK35, ASK40 and ASK41.

### 2.7.3 Electrical accessories

Notes

- If an auxiliary switch is required, its switching point should be indicated on the plant schematic.
- For media below 0 °C the stem heating element ASZ6.6 keeps the valve free from freezing.
- For this case, do not insulate the actuator bracket and the valve stem, as air circulation must be ensured!
- **Non-observance of the above may result in accidents and fires!**
- **Do not touch the hot parts without prior protective measures to avoid burns.**



Stroke actuators		SQX..				SAX..	
		SQX31..	SQX61..	SQX32..	SQX62..	SAX31..	SAX61..
		SQX81..	-	SQX82..	-	SAX81..	-
ASZ6.5	Stem heater	ASZ6.5	ASZ6.5	ASZ6.5	ASZ6.5	<b>ASZ6.6</b>	<b>ASZ6.6</b>
ASZ7.4	1 auxiliary switch, 1 potentiometer (1000 Ω)	ASZ7.4	-	ASZ7.4	-	<b>ASC10.51 + ASZ7.5</b>	-
ASC9.4	Double auxiliary switch	ASC9.4	-	ASC9.4	-	<b>2x ASC10.51</b>	-
ASC9.5	Auxiliary switch	ASC9.5	-	ASC9.5	-	<b>ASC10.51</b>	-

Rotary actuators		SQL..				SAL..	
		SQL31..	SQL32..	SQL33..	-	SAL31..T10	-
		-	-	SQL83..	-	SAL81..T10	-
		-	-	-	SQL35.00	-	SAL31.00T20 / T40
-	-	-	SQL85.00	-	SAL81.00T20 / T40		
ASZ7.4	1 auxiliary switch, 1 potentiometer (1000 Ω)	-	-	ASZ7.4	ASZ7.4	<b>ASC10.51 + ASZ7.5</b>	<b>ASC10.51 + ASZ7.5</b>
ASC9.4	Double auxiliary switch	-	-	ASC9.4	ASC9.4	<b>2x ASC10.51</b>	<b>2x ASC10.51</b>
ASC9.5	Auxiliary switch	-	-	ASC9.5	ASC9.5	<b>ASC10.51</b>	<b>ASC10.51</b>
ASZ8.4	Potentiometer (220 Ω)	ASZ8.4	ASZ8.4	-	-	<sup>1)</sup>	-
ASZ9.4	Potentiometer (2800 Ω)	ASZ9.4	ASZ9.4	-	-	<sup>1)</sup>	-
ASC1.4	Auxiliary switch	ASC1.4	ASC1.4	-	-	<b>ASC10.51</b>	-

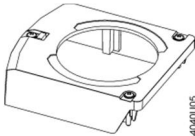
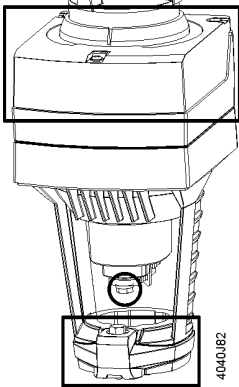

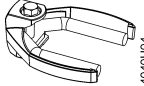
<sup>1)</sup> Used auxiliary switches or potentiometer (order accessories additionally were applicable):

- Check used functionality
- Check compatibility with controller

## 2.8 Spare parts

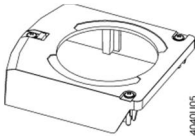
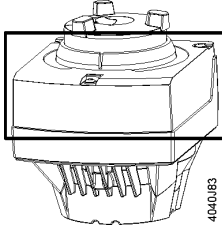


The following spare part sets are available:

### SAY.., SAX.., SAV..

<b>Stock number</b> 8000060843	<b>Housing cover</b> 	
	<b>Screw (valve stem coupling)</b> 	
	<b>U-bracket</b> 	

Single components from the spare part sets are not available.

### SAL..

<b>Stock number</b> 8000060844	<b>Housing cover</b> 	
	<b>2 adapters</b>  1 pc. 14 mm 1 pc. 11 mm	
	<b>4 screws</b>  2 pcs. M5 x 20 mm 2 pcs. M6 x 20 mm	

Single components from the spare part sets are not available.

## 2.9 Sizing

### 2.9.1 Parallel operation of actuators

#### SA..31.. and SA..81..

3-position actuators must have one specific controller each, refer to "Connection diagrams" (page 82).

#### SA..61..

Up to 10 actuators can drive in parallel on a controller output with a rating of 1 mA. Modulating actuators have an input impedance of 100 kΩ.

#### SAX61../MO

The Modbus converter is designed for analog control on 0..10 V on the actuator side.

**Note:** Keep the setting of the analog signal on the actuator as is (switch 1 to "OFF"), adjustment is not allowed.

The actuators are factory-set to equal-percentage characteristic curve.

**Note:** The DIL switch (actuator-internal changeover of characteristic curve) must be set to "log" (switch 2 to "OFF").

## 2.9.2 Permissible cable lengths and wire cross-sectional areas

Cable lengths and wire cross-sectional areas depend on the following criteria of the actuators:

- Current draw
- Permissible voltage drop across the power supply lines

The control accuracy of the modulating actuators can be improved by using 4-wire connections, thus ensuring that voltage drops on G0 will not distort the positioning signal.

Note

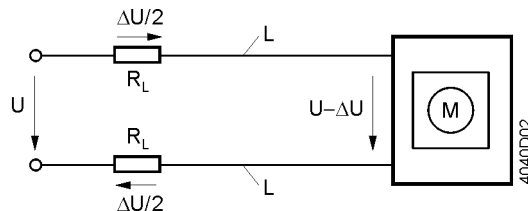
When determining the cable length and the wire cross-sectional area, adherence to the permissible operating voltage tolerance at the actuator is of importance, in addition to the permissible voltage drop across the operating voltage and signal lines (see table below).

Product no.	Operating voltage	Terminal	Max. permissible voltage drop
SA..31..	AC 230 V	N, Y1, Y2	2% each (total of 4%)
SA..61..	AC/DC 24 V	G0, G	4% each (total of 8%)
		G0, Y, U	1% each (at DC 0...10 V)
SA..81..		G, Y1, Y2	4% each (total of 8%)

The following criteria must be considered:

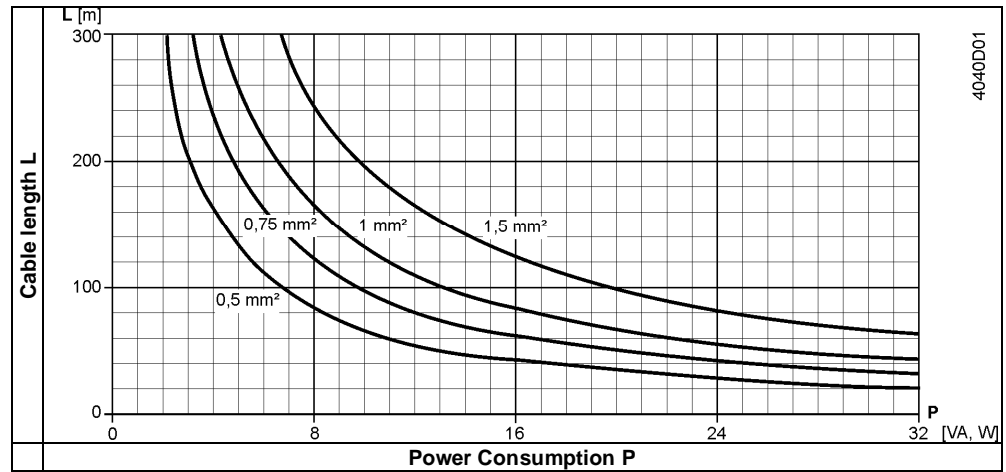
- With modulating control, the permissible positioning signal error must not exceed 1%, the reason being the voltage drop on the G0 wire.
- The voltage drop, caused by charging current peaks in the actuator's DC circuit, must not exceed 2 Vpp.
- If the G0 line is not correctly sized, load changes of the actuator due to changes of the DC voltage drop might lead to self-oscillations.
- The operating voltage drop at AC/DC 24 V may be a maximum of 8% (4% above the G0 wire).

**Basic diagram – voltage drop across the power supply cables**



The following diagram can be used to determine the cable lengths and wire cross-sectional areas.

**L/P-diagram for AC/DC 24 V**



Permissible cable length **L** as a function of power **P** and cross-sectional area of wire as a parameter

**Note**

**P** is the decisive power consumption of all actuators connected in parallel. When operating on AC 24 V, power consumption is in VA; when operating on DC 24 V, in W.

**Formulas for wire lengths**

Operating voltage	Permissible voltage drop / wire	Formula for wire length
AC 230 V	2% of AC 230 V	$L = 46 \cdot \frac{1313 \cdot A}{P}$ [m]
AC/DC 24 V	4% of AC 24 V	$L = \frac{1313 \cdot A}{P}$ [m]
	1% of DC 10 V	$L = \frac{5.47 \cdot A}{I(\text{DC})}$ [m]

- A Cross-sectional area of wire in mm<sup>2</sup>
- L Permissible wire length in m
- P Power consumption in VA (AC) or W (DC) (see actuator's rating plate)
- I(DC) DC current part (in A) on G0 wire

## 2.10 Warranty

The engineering data specified in chapter "Equipment combinations" (page 14) are only guaranteed in connection with the Siemens valves listed.

**Note**

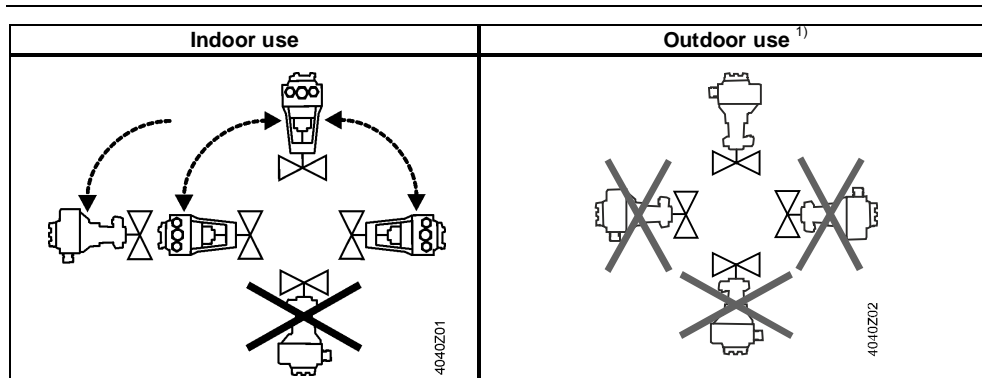
When using the actuators in connection with valves of other manufacture, correct functioning must be ensured by the user, and Siemens will assume no responsibility.



### 3 Handling

#### 3.1 Mounting and installation

##### 3.1.1 Mounting positions



<sup>1)</sup> Only in connection with weather shield ASK39.1

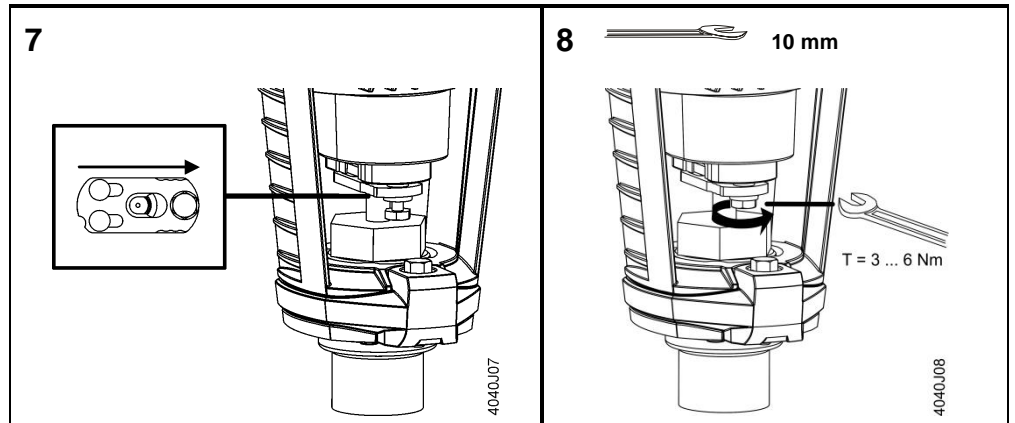
SAX61../MO is not suitable for outdoor applications.

### 3.1.2 Fitting stroke actuators to seat valves VVF.. / VXF.. or VVG.. / VXG..

First, observe "Mounting positions" (page 25).

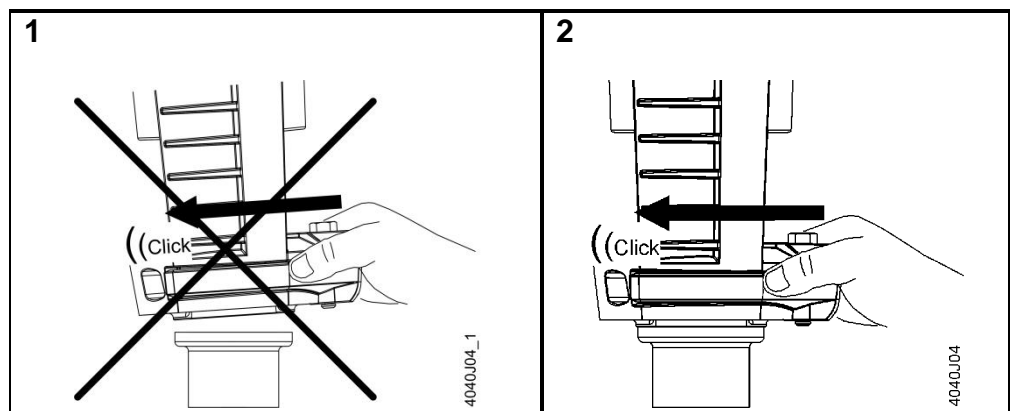
	<p><b>Caution!</b>  <b>Risk of burns from hot surfaces!</b>          If you touch heated parts, you will get burns as result.</p> <ul style="list-style-type: none"> <li>• Allow to cool parts.</li> <li>• Wear protective gloves.</li> </ul>
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<p><b>1 Actuator's stem retracted</b></p>	<p><b>2</b></p>
<p><b>3</b></p>	<p><b>4</b></p>
<p><b>5</b></p>	<p><b>6</b></p>



### 3.1.3 Avoid missalignment on V\_G41 valves with fittings

	<p><b>Caution!</b>  <b>Risk of burns from hot surfaces!</b>          If you touch heated parts, you will get burns as result.</p> <ul style="list-style-type: none"> <li>• Allow to cool parts.</li> <li>• Wear protective gloves.</li> </ul>
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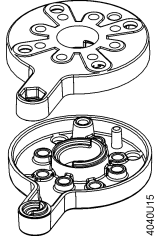
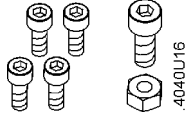
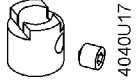
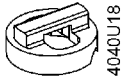


On threaded valves it's possible that the actuator is missaligned on the valve due to a collision with the fitting. If so, please take care for correct mounting, either by turning the actuator or by adjusting the fitting (e.g. use a second sealing to change fitting position).

### 3.1.4 Fitting rotary actuators to butterfly valves VKF41..


First, observe "Mounting positions" (page 25).

#### Mounting set ASK33N

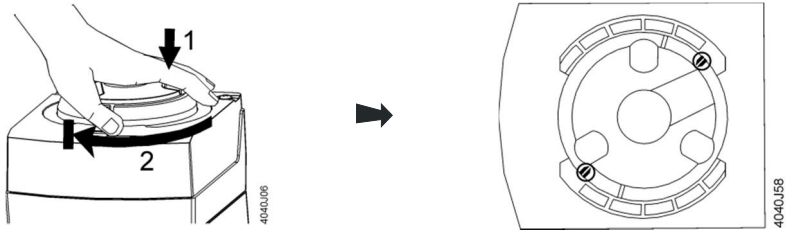
Scope of delivery			
Mounting set (2 parts)	5 screws	1 adapter inc. fixing screw	1 adapter
	4 pcs. M6 x 16 mm 1 pc. M5 x 20 incl. nut 		

#### Note

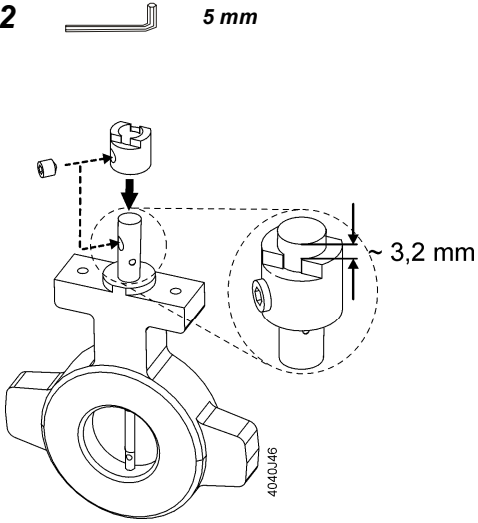
Actuators SAL.. are not compatible with mounting sets ASK31, ASK32, ASK33, ASK35, ASK40, and ASK41.

	<p><b>Caution!</b>  <b>Risk of burns from hot surfaces!</b>          If you touch heated parts, you will get burns as result.</p> <ul style="list-style-type: none"> <li>• Allow to cool parts.</li> <li>• Wear protective gloves.</li> </ul>
---	---

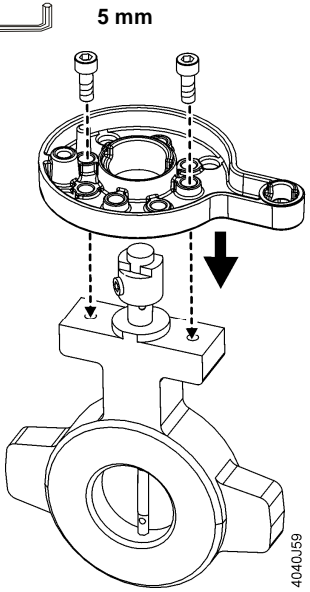
**1**

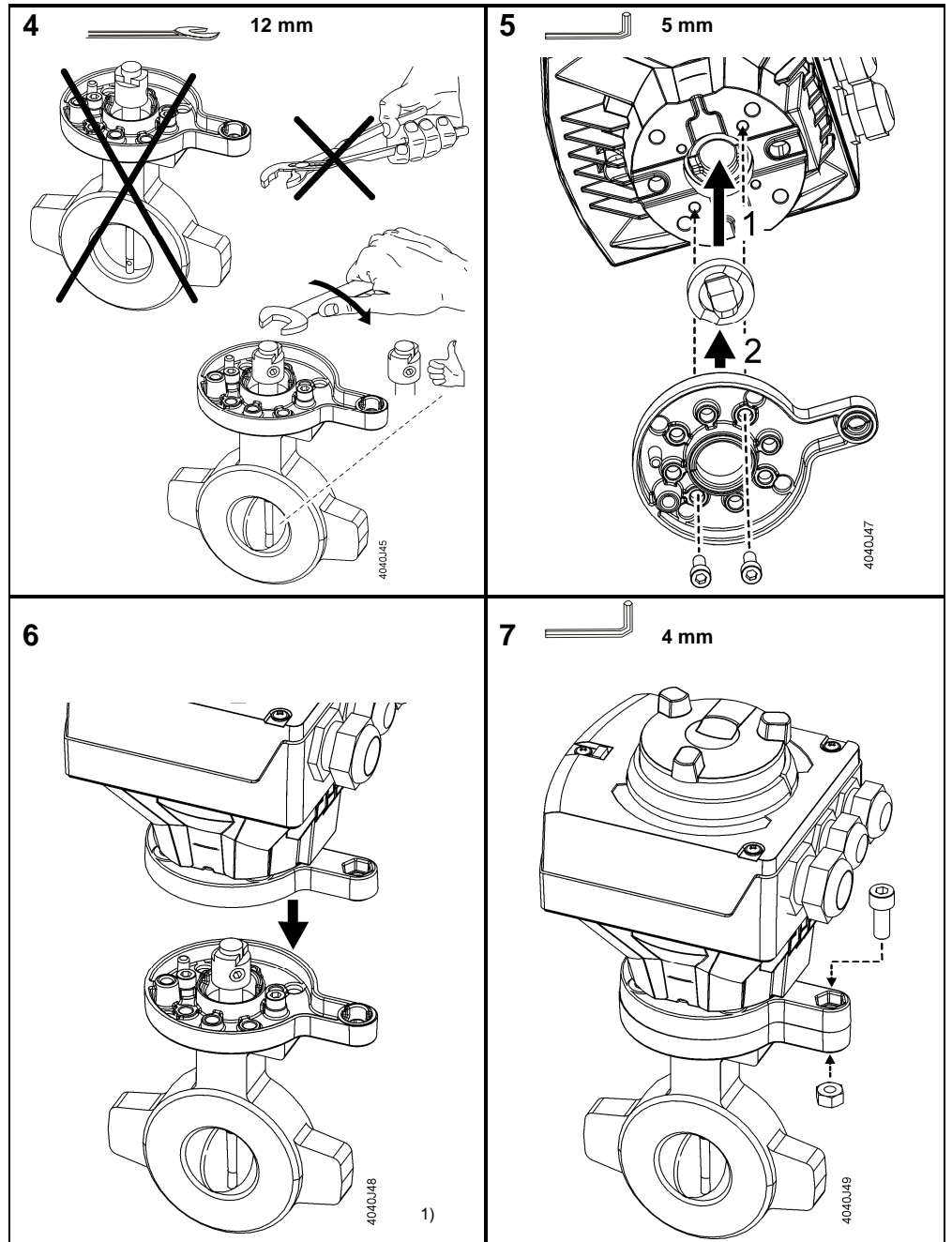


**2**



**3**



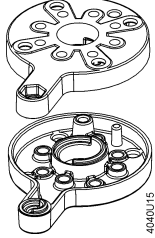
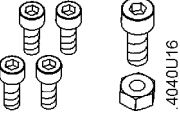

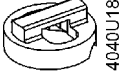


<sup>1)</sup> Angle position errors between actuator shaft and valve stem must be corrected via manual control (refer to "Manual adjuster" page 73).


### 3.1.5 Fitting rotary actuators to slipper valves VBF21..

First, observe "Mounting positions" (page 25).

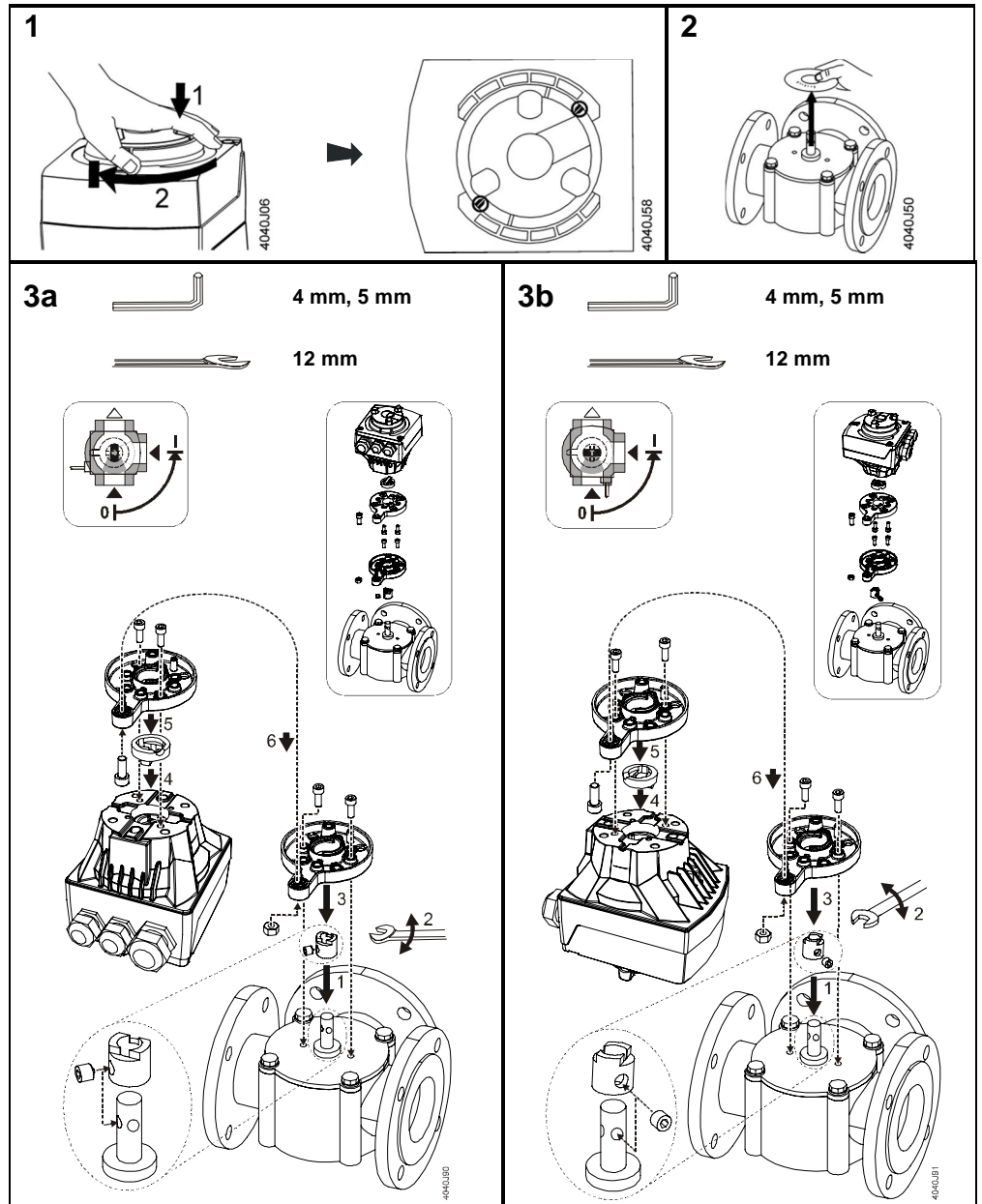
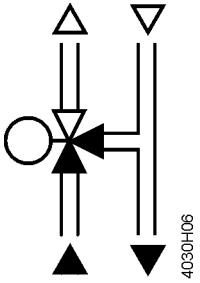
#### Mounting set ASK31N

Scope of delivery			
Mounting set (2 parts)	5 screws	1 adapter incl. fixing screw	1 adapter
	4 pcs. M6 x 16 mm 1 pc. M5 x 20 mm incl. nut 		

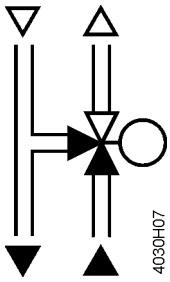
SAL..T10 rotary actuators only fit on VBF21..., DN65...150. For VBF21..., DN40/50 use SQK34..., SQK84.. or SQK33.00 rotary actuators.  
With VBF21.. (e.g. DN 125), the following steps must be performed prior to fitting the mounting set.

	<b>Caution!</b>
	<p><b>Risk of burns from hot surfaces!</b></p> <p>If you touch heated parts, you will get burns as result.</p> <ul style="list-style-type: none"> <li>• Allow to cool parts.</li> <li>• Wear protective gloves.</li> </ul>

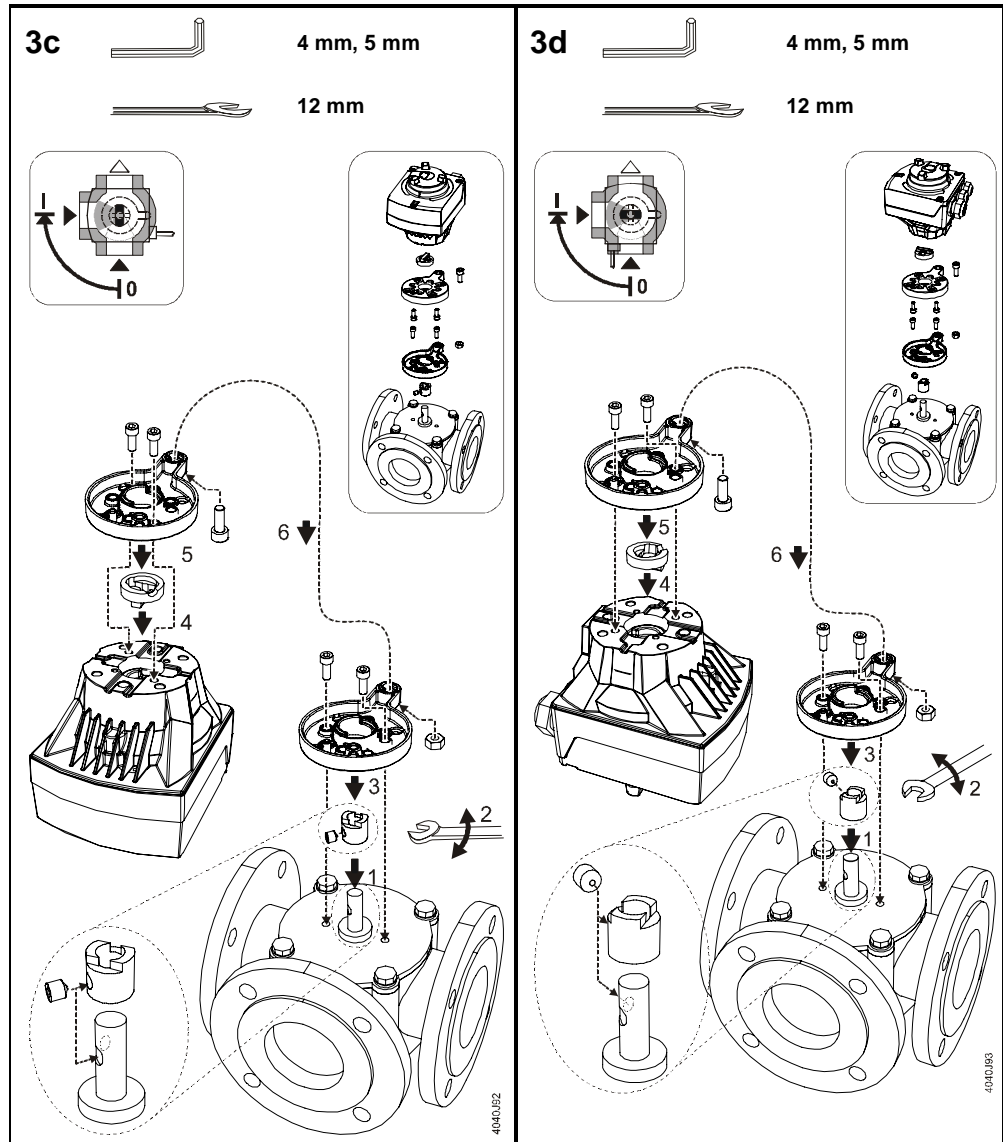
Opening counterclockwise



Opening clockwise



4030-H07




For further mounting positions of VBF 21.. and routing of the connection cables the rotary actuators and adapters must be mounted according to the sketches above.




### 3.1.6 Fitting rotary actuators to butterfly valves VKF46..

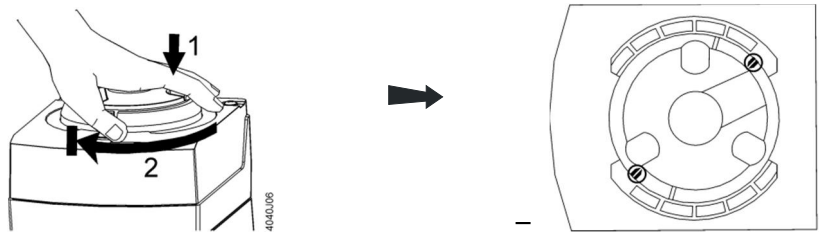
First, observe "Mounting positions" (page 25).

**Standard scope of delivery**  
VKF46..

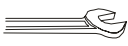
Product no.	Scope of delivery		
	2 screws		1 dapter
SAL..T20	2 pcs. M5 x 20 mm		1 pc. 11 mm
SAL..T40	2 pcs. M6 x 20 mm		1 pc. 14 mm

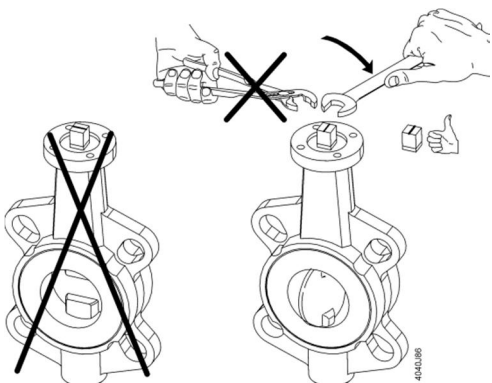
	<b>Caution!</b>
	<p><b>Risk of burns from hot surfaces!</b></p> <p>If you touch heated parts, you will get burns as result.</p> <ul style="list-style-type: none"> <li>• Allow to cool parts.</li> <li>• Wear protective gloves.</li> </ul>

**1**

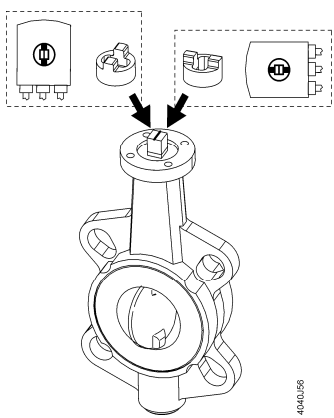


**2**



- 11 mm (DN 40...50)  
- 14 mm (DN 80...125)

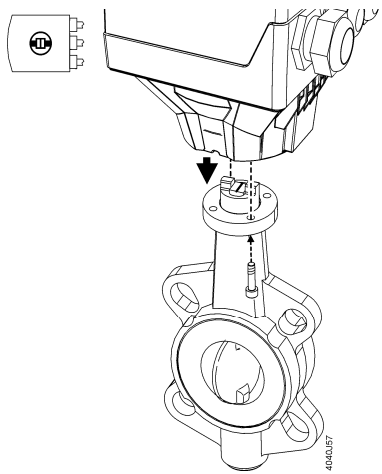


**3**



**4**

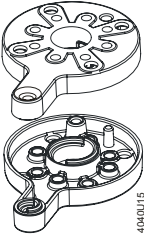
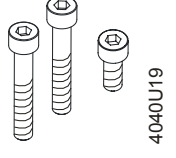
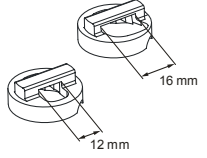

-4 mm (DN 40...65)  
-5 mm (DN 80...125)



### 3.1.7 Fitting rotary actuators to butterfly valves VKF45..


First, observe "Mounting positions" (page 25).

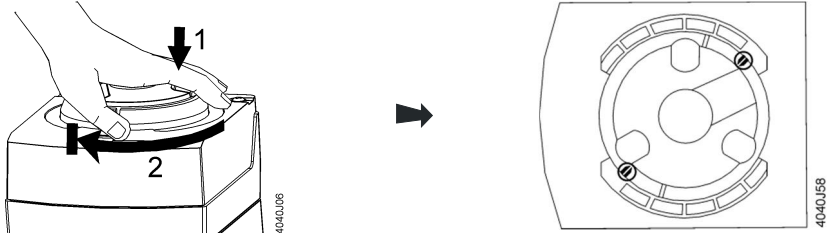
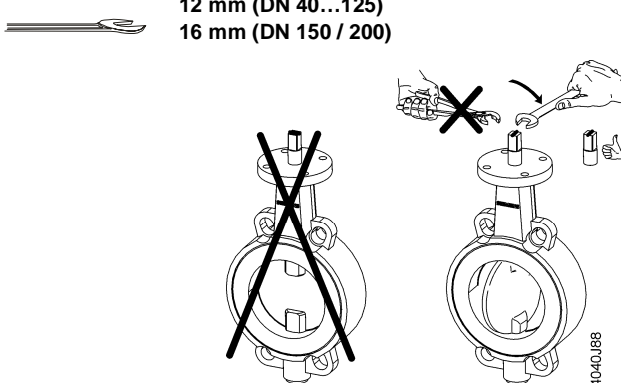
#### Mounting set ASK35N For VKF45..

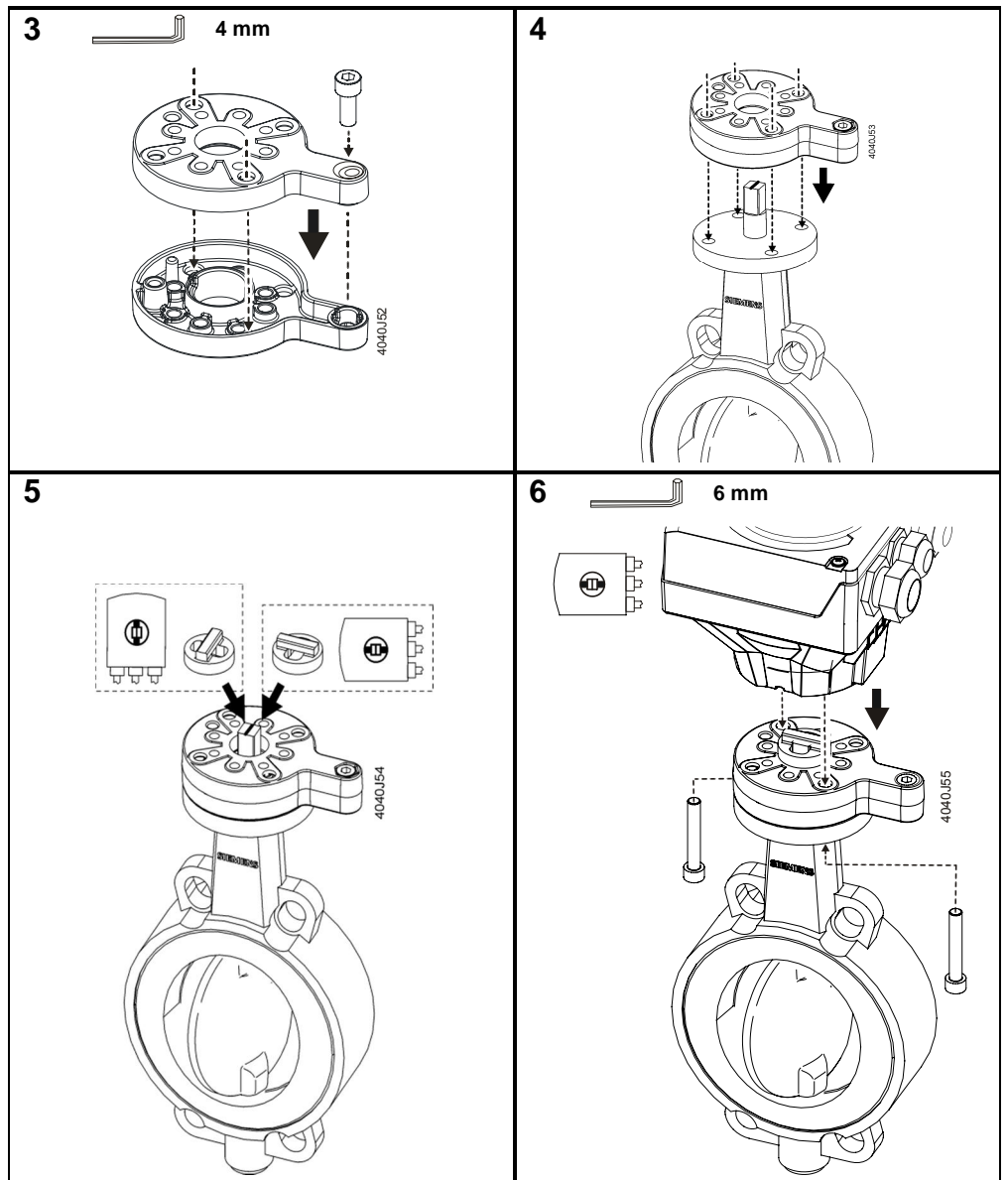
Scope of delivery		
Mounting set (2 parts)	5 screws	2 adapters
	2 pcs. M8 x 50 mm 1 pc. M5 x 20 mm incl. nut	1 pc. 12 mm 1 pc. 16 mm
		

#### Note

Actuators SAL.. are not suited for use with mounting sets ASK31, ASK32, ASK33, ASK35, ASK40, and ASK41.

	<b>Caution!</b>
	<b>Risk of burns from hot surfaces!</b> If you touch heated parts, you will get burns as result. <ul style="list-style-type: none"> <li>• Allow to cool parts.</li> <li>• Wear protective gloves.</li> </ul>

<b>1</b>	
<b>2</b>	 <p>12 mm (DN 40...125) 16 mm (DN 150 / 200)</p>




### 3.1.8 Fitting accessories

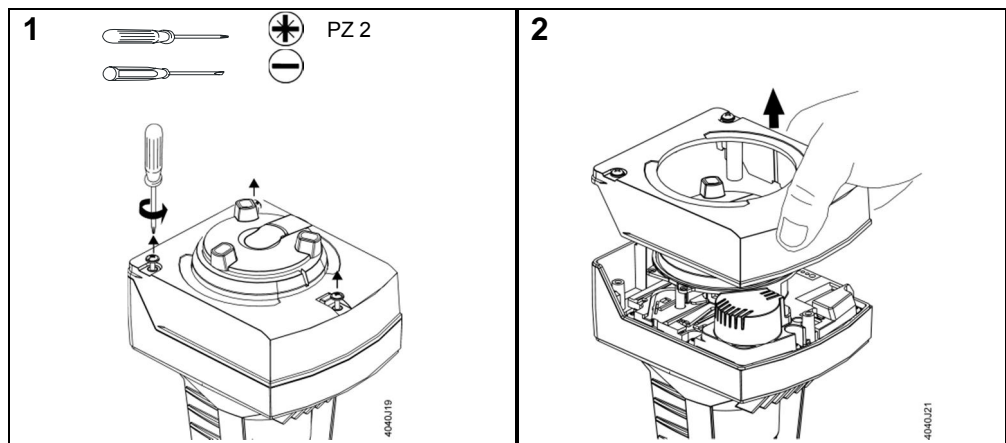
#### Special notes on mounting

SA..31..

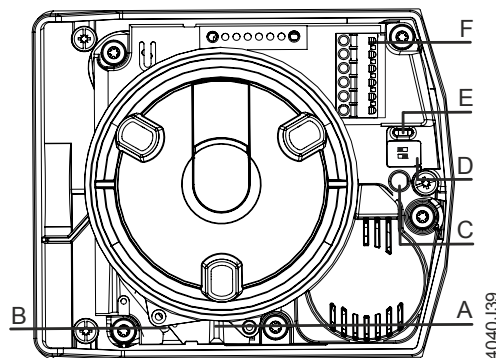
Before fitting the accessory items shown below, the following steps must be performed:

	<b>Danger!</b>
	<b>Danger to life from electrical current!</b> There is an immediate risk of fatal injury in case of contact with live parts of SA..31... <ul style="list-style-type: none"> <li>• Disconnect actuator from power.</li> </ul>

1. Actuator is mechanically connected to a Siemens valve.
2. Observe compatibility and choice of combinations. Refer to "Accessories" (page 19).
3. Disconnect actuator from power.
4. Only required with actuators without fail safe function: Using the manual adjuster, drive the actuator's stem to the fully retracted position and fix the coupling. See "Manual operation" and "Fixing coupling" (page 73).
5. When mounting two different accessories watch out for correct plug-in space A or B (see below).
6. To fit an auxiliary switch, potentiometer or function module, the housing cover must be removed.

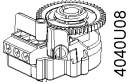


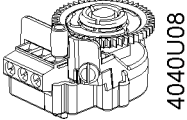

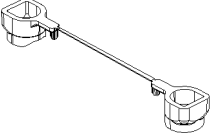
Interior view of setting elements and plug-in spaces



	Plug-in space for...
<b>A</b>	<ul style="list-style-type: none"> <li>• Potentiometer ASZ7.5, or</li> <li>• Auxiliary switch ASC10.51</li> </ul>
<b>B</b>	Plug-in space for... <ul style="list-style-type: none"> <li>• Function module AZX61.1 , or</li> <li>• Auxiliary switch ASC10.51</li> </ul>
<b>C</b>	LED
<b>D</b>	DIL switches
<b>E</b>	Calibration slot
<b>F</b>	Connection terminals


**Potentiometer  
ASZ7.5**



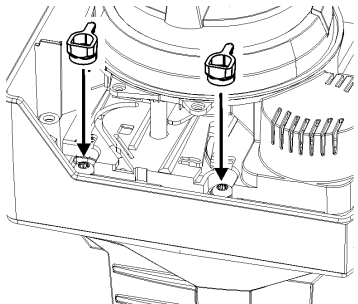
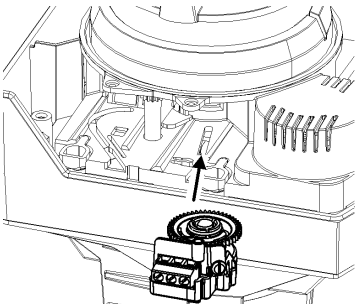
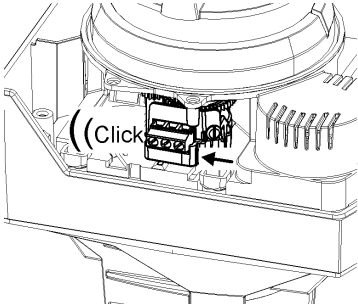
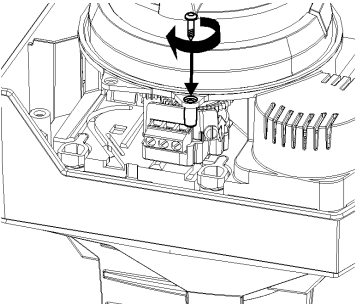
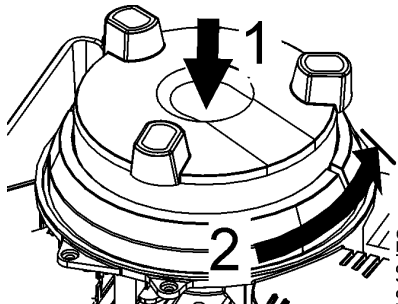
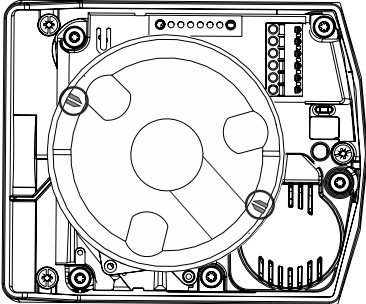
Scope of delivery		
1 potentiometer ASZ7.5	1 screw	2 screw covers
 4040U08	1 pc.  4040U28	 4040U29

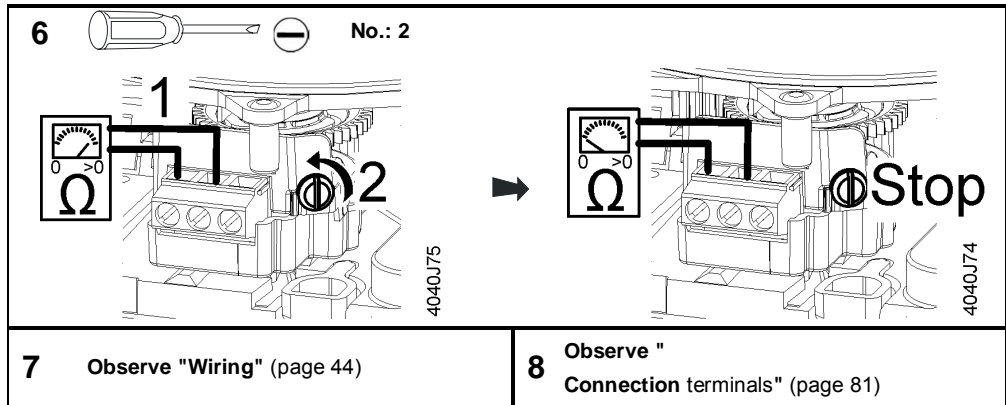


First, observe "Special notes on mounting" (page 36).

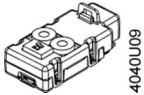
	<p><b>Danger!</b> <b>Danger to life from electrical current!</b> If a live wire gets in contact with the screws the whole actuator housing is a live.</p> <ul style="list-style-type: none"> <li>• Fit the screw covers first.</li> </ul>
---	---

Plug-in space A

<p><b>1</b></p>  <p style="text-align: right;">4040J61</p>	<p><b>2</b></p>  <p style="text-align: right;">4040J26</p>	
<p><b>3</b></p>  <p style="text-align: right;">4040J27</p>	<p><b>4</b></p>  <p style="text-align: right;">4040J63</p>	
<p><b>5</b></p> <p style="text-align: center;"><b>Turn to 0%</b></p>  <p style="text-align: right;">4040J72</p>		 <p style="text-align: right;">4040J73</p>



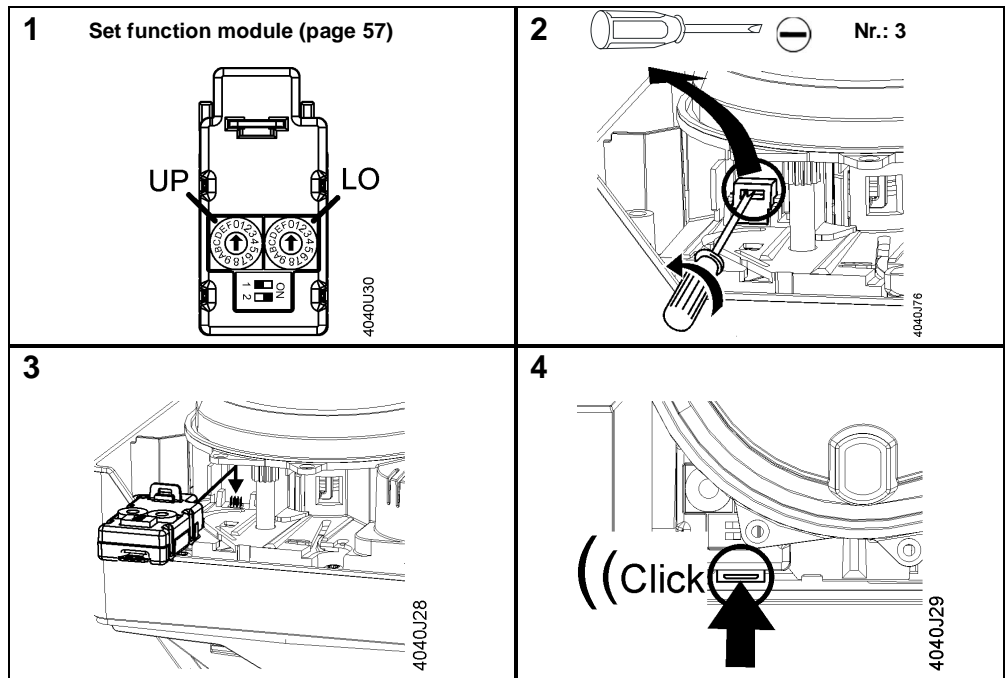
**Function module  
AZX61.1**



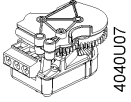
4040J09

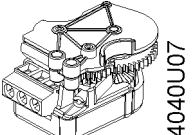

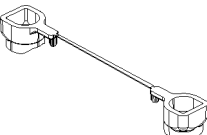
Plug-in space B

First, observe "Special notes on mounting" (page 36).




**Auxiliary switch  
ASC10.51**



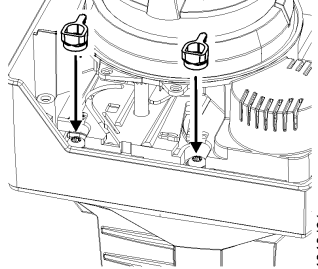
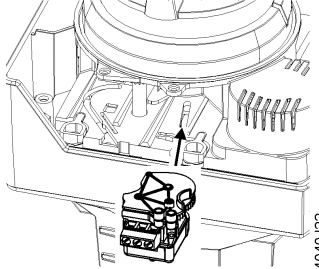
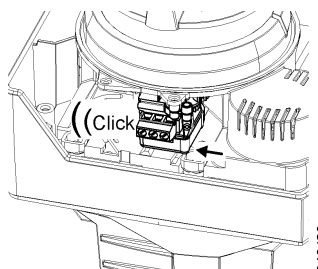
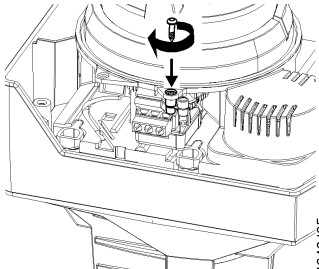
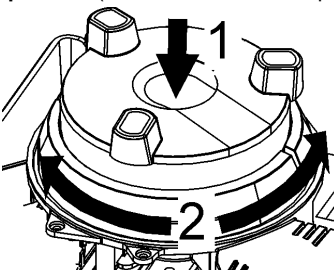
Scope of delivery		
1 auxiliary switch ASC10.51	1 screw	2 screw covers
 4040U07	1 pc.  4040U28	 4040U29

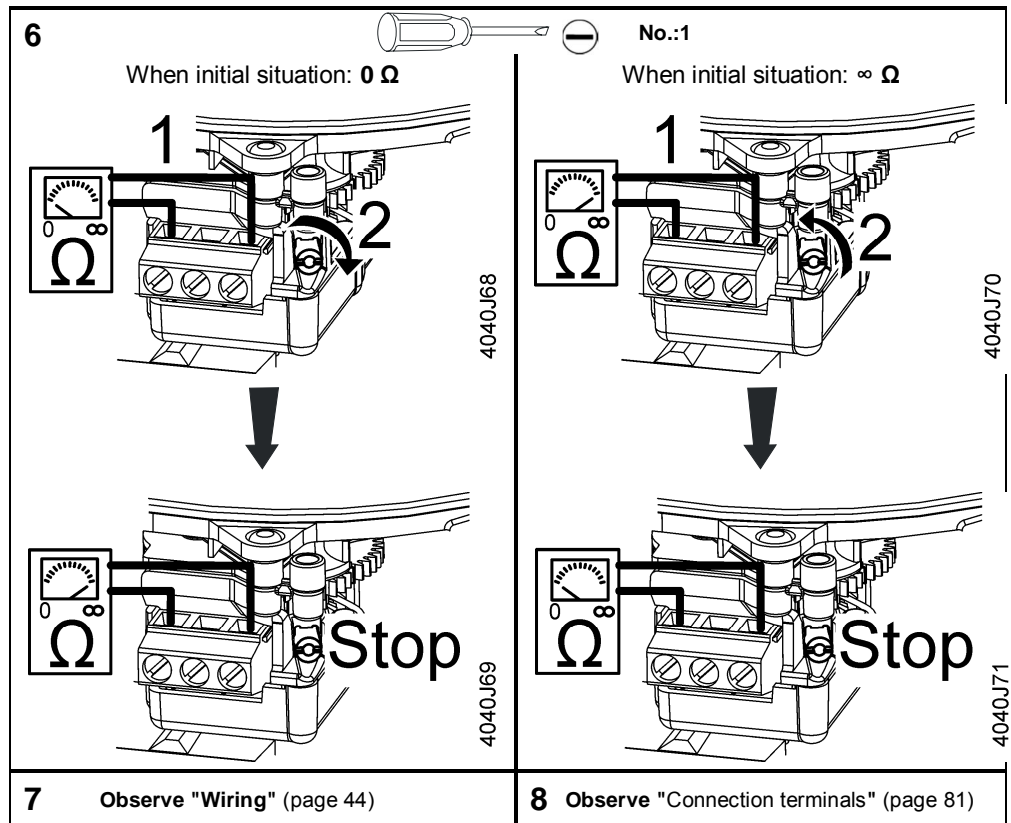


First, observe "Special notes on mounting" (page 36).

	<b>Danger!</b>
	<p><b>Danger to life from electrical current!</b> If a live wire gets in contact with the screws the whole actuator housing is a live.</p> <ul style="list-style-type: none"> <li>• Fit the screw covers first.</li> </ul>

**Plug-in space A**

<b>1</b>		<b>2</b>	
<b>3</b>		<b>4</b>	
<b>5</b>	<p><b>Adjust switch position</b> (refer also to "Manual operation" page 73)</p> 		



First, observe "Special notes on mounting" (page 36).



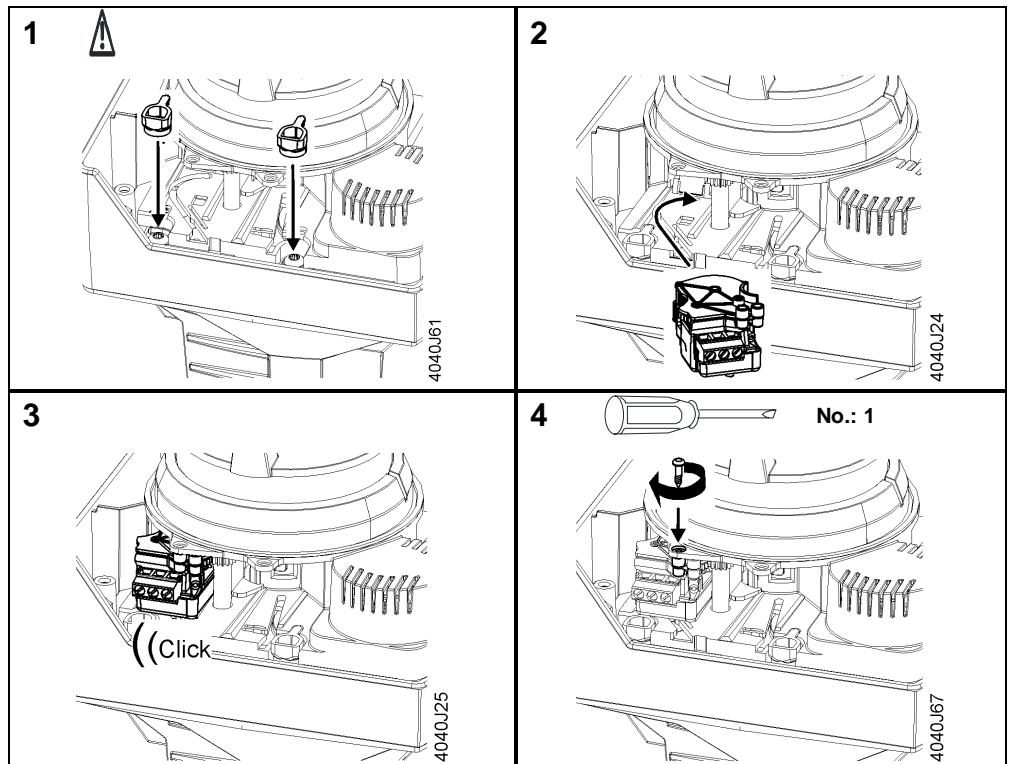
**Danger!**

**Danger to life from electrical current!**

If a live wire gets in contact with the screws the whole actuator housing is a live.

- Fit the screw covers first.

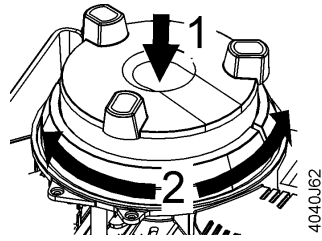
Plug-in space B





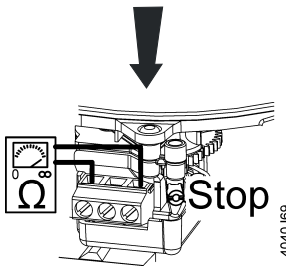
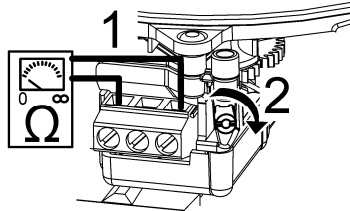
5

Adjust switch position (refer also to "Manual operation" page 73)



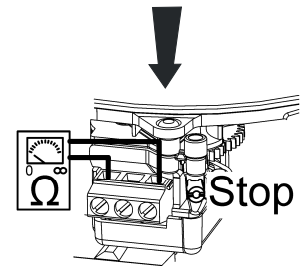
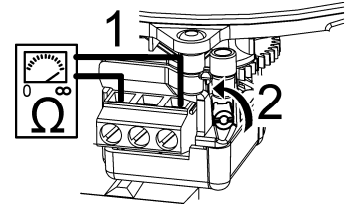
6

When initial situation:  $0 \Omega$



No.: 1

When initial situation:  $\infty \Omega$



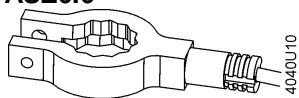
7

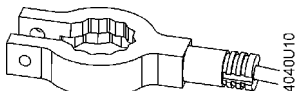
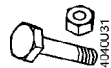
Observe "Wiring" (page 44)

8

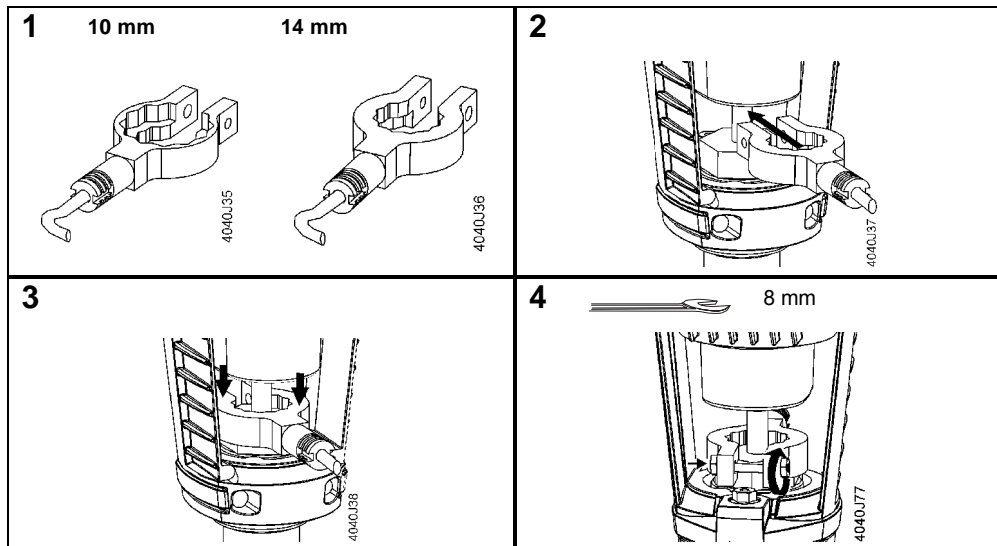
Observe "Connection terminals" (page 81)

**Stem heating element  
ASZ6.6**

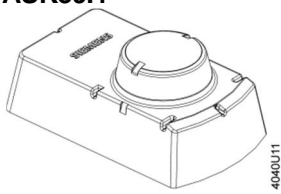


Scope of delivery	
1 stem heating element ASZ6.6	1 screw
	1 pc. M4 x 30 incl. nut 

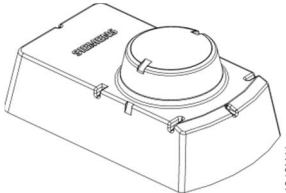
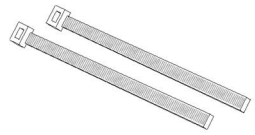
When fitting the stem heating element, stroke actuator and valve must be assembled. The stem heating element is powered separately. First, observe "Special notes on mounting" (page 36).



**Weather shield  
ASK39.1**

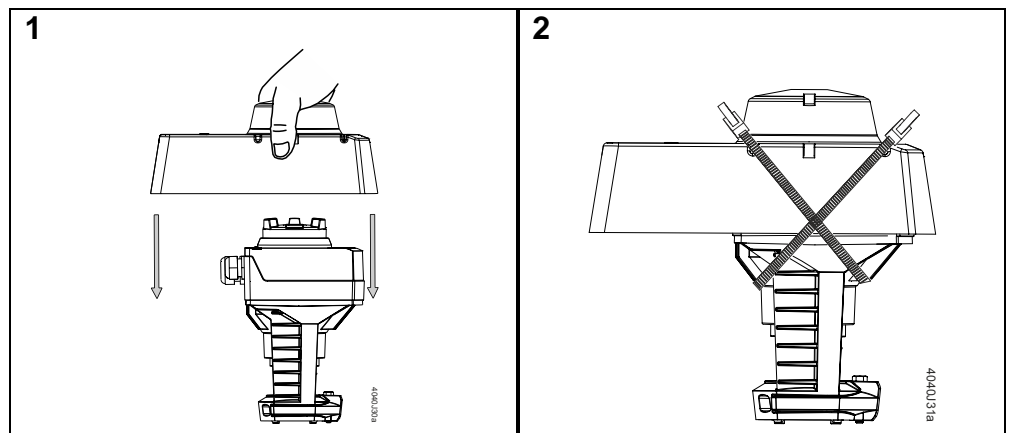


First, observe "Special notes on mounting" (page 36).

Scope of delivery	
Weather shield ASK39.1	2 UV-proof cable ties
	

**Notes**

- To protect the actuator when used outdoors, the weather shield must always be fitted.
- If fitted several times, 2 UV-proof cable ties (800 x 4 mm) must be used.
- The manual adjuster cannot be used when the weather shield is mounted.
- SAX61../MO is not suitable for outdoor applications.

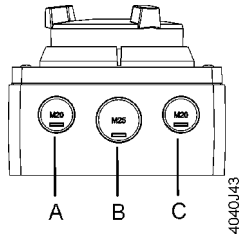
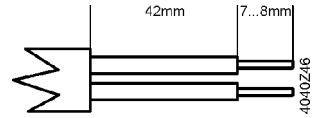


### 3.1.9 Wiring (installation)

Conduct the electrical connections in accordance with local regulations on electrical installations as well as the "Connection diagrams" on page 81.

#### Preparation of wire endings

The cable endings must be prepared before as follows.



<b>A</b>	EU: M20 US: ½"	Standard	Connection actuator
<b>B</b>	EU: M25 US: ½"	Ground cable for outdoor installation	
<b>C</b>	EU: M20 US: ½"		Connection accessories

Cable glands (not contained in scope of delivery)		
Metric	Metric	Inch thread
M20	M25	½"

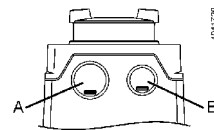
Prior to installation, the following preconditions must be satisfied:

- Actuator is mechanically connected to a Siemens valve.
- Housing cover is removed (step 6 "Special notes on mounting", page 36).


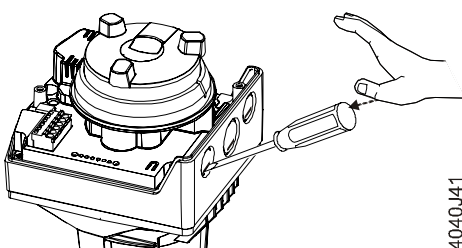
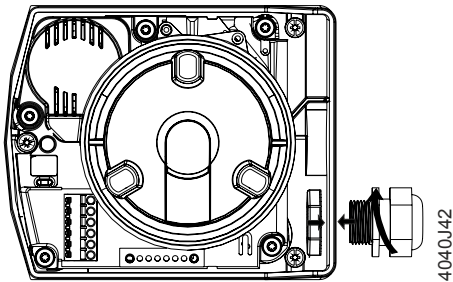
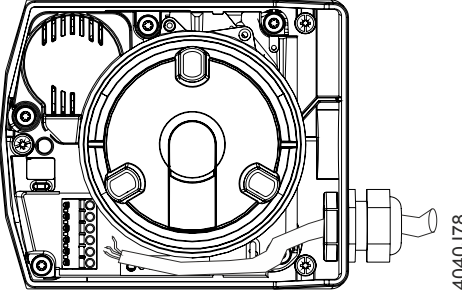
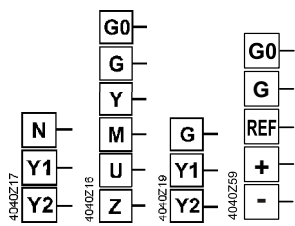
#### Communicating actuators



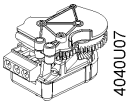
Device contains fixed connecting cable. Left cable duct used (A).



**Actuator**

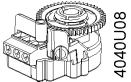
<p><b>1</b>  <b>No.: 4</b></p>  <p>4040J41</p>	<p><b>2</b></p>  <p>4040J42</p>
<p><b>3</b></p>  <p>4040J78</p>	<p><b>4</b> Observe " Connection terminals" (page 81)</p> 


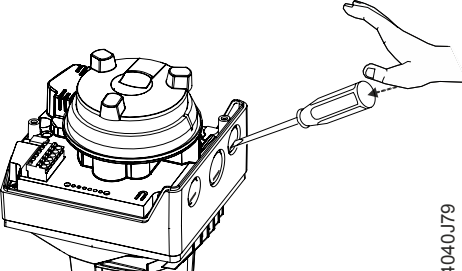
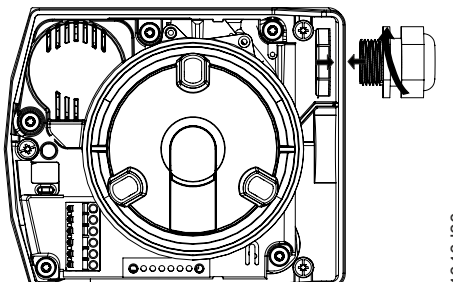
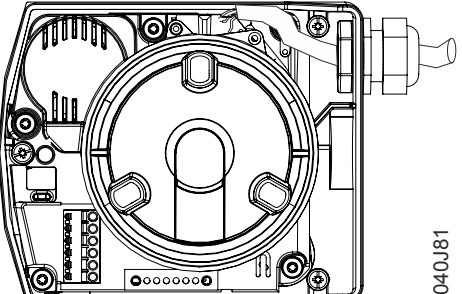
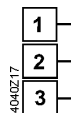
**Auxiliary switch  
ASC10.51**



and

**Potentiometer  
ASZ7.5**



<p><b>1</b>  <b>No.: 4</b></p>  <p>4040J79</p>	<p><b>2</b></p>  <p>4040J80</p>
<p><b>3</b></p>  <p>4040J81</p>	<p><b>4</b> Observe " Connection terminals" (page 81)</p> 

## 3.2 Commissioning and operation

### 3.2.1 Function check and Calibration

#### Mechanically

Before making the function check, the following preconditions must be satisfied:

- Environmental conditions specified in chapter "Technical data" (page 77)
- Actuator is mechanically connected to a Siemens valve
- **Actuator is in "Manual operation" mode** (page 73).

The actuator can be operated with the help of the "Manual adjuster" (see page 73).

Manual adjuster	Stroke actuator	Rotary actuator	Control path valve A→AB	Bypass valve B → AB
Turning in clockwise direction	Actuator's stem extends	Actuator's spindle turns in clockwise direction	Opening	Closing
Turning in counter-clockwise direction	Actuator's stem retracts	Actuator's spindle turns in counterclockwise direction	Closing	Opening

#### Notes

- Ensure that the actuator's and valve's stem, or actuator's and valve's spindle are securely connected in all positions.
- If the actuator is forced to travel beyond its end positions, overload protection responds.
- Observe information given in chapter "Acting direction and flow characteristic" on page 61.

#### Electrically

Before making the function check, the following preconditions must be satisfied:

- Environmental conditions specified in chapter "Technical data" (page 77).
- Actuator is mechanically connected to a Siemens valve.
- **Actuator is in "Automatic" mode** (page 73).

Actuator and, if required, accessories are correctly fitted and connected. Also refer to "Connection Terminals" (page 81)

- Power is applied.

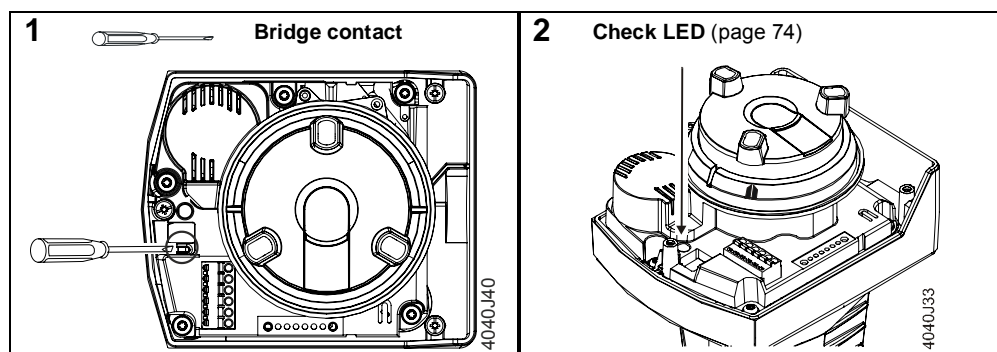
#### SA..61..

Calibration is required with modulating actuators and SA..61.. before the function check.

#### General notes on calibration

Before making the calibration, the following preconditions must be satisfied:

- A description of the calibration function is given in chapter "Calibration" (page 64).
- Housing cover is removed (step 6 "Special notes on mounting", page 36).



If required, calibration can be repeated any number of times.

Make the function check for modulating actuators after the calibration with a point test according to the following table:

**SAX61.03/03U, SAV61.00/00U and SAL61..**

Connection terminals	Stroke actuator		Rotary actuator	Control path valve A→AB	Bypass valve B → AB	Position feedback U	
	log <sup>1)</sup>	lin <sup>1)</sup>				log <sup>1)</sup>	lin <sup>1)</sup>
Y 6 V 13,6 mA	Actuator's stem extends (60%)	Actuator's stem extends (82%)	Actuator's spindle turns in clockwise direction (60 %)	Opening	Closing	6 V	8,2 V
Y 5 V 12 mA	Actuator's stem retracts (50%)	Actuator's stem retracts (75%)	Actuator's spindle turns in counterclockwise direction (50 %)	Closing	Opening	5 V	7,5 V
Z connected to G	Actuator's stem extends		Actuator's spindle turns in clockwise direction	Opening	Closing	10 V	
Z connected to G0	Actuator's stem retracts		Actuator's spindle turns in counterclockwise direction	Closing	Opening	0 V	

<sup>1)</sup> SAX61.03.. and SAV61.00.. factory setting **log**, SAL61.. factory setting **lin**

**SAY61P.., SAX61P03.., SAV61P00...**

Connection terminals	Stroke actuator		Rotary actuator	Control path valve A→AB	Bypass valve B → AB	Position feedback U	
	log <sup>1)</sup>	lin <sup>1)</sup>				log <sup>1)</sup>	lin <sup>1)</sup>
Y 6 V 13,6 mA	Actuator's stem retracts (30%)	Actuator's stem retracts (60%)	-	Opening	Closing	2.95 V	6 V
Y 5 V 12 mA	Actuator's stem extends (23%)	Actuator's stem extends (50%)	-	Closing	Opening	2.3 V	5 V
Z connected to G	Actuator's stem retracts		-	Öffnet	Schliesst	10 V	
Z connected to G0	Actuator's stem extends		-	Schliesst	Öffnet	0 V	

<sup>1)</sup> SAY61P.., SAX61P.., SAV61P.. factory setting **log**

SA..31.. and SA..81..

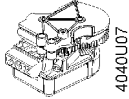
Make the function check for 3-position actuators according to the following table:

Connection terminals	Stroke actuator	Rotary actuator	Control path valve A→AB	Bypass valve B → AB
Voltage at Y1	Actuator's stem extends	Actuator's spindle turns in clockwise direction	Opening	Closing
Voltage at Y2	Actuator's stem retracts	Actuator's spindle turns in counterclockwise direction	Closing	Opening
No voltage at Y1 and Y2	Actuator's stem maintains the position	Actuator's spindle maintains the position	Maintains the position	

Notes

- If function module AZX61.1 is used, observe information given in chapter "Changeover of acting direction" (page 59).
- Observe information given in chapter "Acting direction and flow characteristic" on page 61.

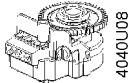
## Auxiliary switch ASC10.51



Make the function check for mounted auxiliary switches according to the following table – example switching point at 25% position:

Connection terminals		Stroke actuator	Rotary actuator	Terminal S1 – S3	Terminal S1 – S2
Voltage at Y2	Y = 0 V	Actuator's stem retracts (until end position is reached)	Actuator's spindle turns in counter-clockwise direction (until end position is reached)	-	-
No voltage at Y1 und Y2	Y = 0 V	Actuator's stem maintains the position	Actuator's spindle maintains the position		
Voltage at Y1 for desired valve position % + 2% x positioning time <b>Example:</b> SAX31.00 = 27% x 120 sec = 32.5 sec	Valve position % + 2% Y = 2.7 V	Actuator's stem extends to desired position (27%)	Actuator's spindle turns in clockwise direction to desired position (27%)		
Check switching point with voltmeter		Actuator's stem maintains the position	Actuator's spindle maintains the position	-	-

## Potentiometer ASZ7.5



Make the function check for mounted potentiometer according to the following table (Example values for ASZ7.5):

Connection terminals		Stroke actuator	Rotary actuator	Terminal P1 – P2	Terminal P2 – P3
Voltage at Y2		Actuator's stem retracts (until end position is reached)	Actuator's spindle turns in counter-clockwise direction (until end position is reached)	-	-
No voltage at Y1 und Y2		Actuator's stem maintains the position	Actuator's spindle maintains the position	< 1 Ω	> 996 Ω
Voltage at Y1 for desired valve position % positioning time <b>Example:</b> SAX31.00 = 75% x 120 sec = 90 sec		Actuator's stem extends to desired position (75%)	Actuator's spindle turns in clockwise direction to desired position (75%)	-	-
Check position value with ohmmeter		Actuator's stem maintains the position	Actuator's spindle maintains the position	~ 560 Ω	~ 436 Ω
Voltage at Y2 for desired change of valve position % x positioning time <b>Example:</b> SAX31.00 = 10% x 120 sec = 12 sec		Actuator's stem retracts to desired position (65%)	Actuator's spindle turns in counter-clockwise to desired position (65%)	-	-
Check position value with ohmmeter		Actuator's stem maintains the position	Actuator's spindle maintains the position	~ 485 Ω	~ 511 Ω



## 3.2.2 Commissioning Modbus RTU

The devices were developed specifically for use with Climatix push-button configuration as described in document CE1A3975 <sup>1)</sup>.

As an alternative, the bus can be configured via the local HMI; see Section **User interface**, pg. 50.

Check the following during commissioning:

- Bus configuration (address, baud rate, type of transmission and optional termination). Standard address 255 allows for installation and commissioning of several actuators simultaneously without mutual interference.
- The actuator parameters (direction for opening, position limits, position adjustment etc.) can be read via the Modbus register.

<sup>1)</sup> Documents can be downloaded at <http://www.siemens.com/bt/download>

### Full or partial configuration via bus

The actuators can be configured via bus connection if the settings prior to commissioning allow for a connection to the Modbus master/programming tool (no address conflicts and correct baud rates/transmission format settings).

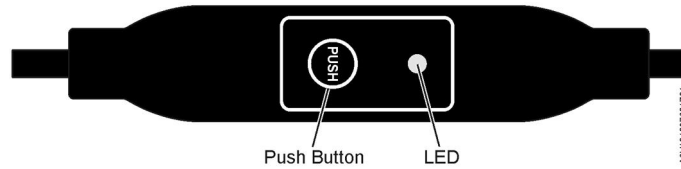
- Full configuration via bus: With a unique Modbus address, a connection can be established from Modbus master/programming tool following startup by means of the preset transmission format and baud rate (or auto-baud).
- Partial configuration via bus: If the Modbus address is not unique, it must first be set to a unique value, either by using the address input with push button (cf. page 51) or by setting the address to 246 with push button press > 5s und < 10s (cf. page 50). Full configuration via bus: With a unique Modbus address, a connection can be established from Modbus master/programming tool following startup by means of the preset transmission format and baud rate (or auto-baud)..

With an existing connection, the bus and actuator parameters can be set to target values via the bus. During write access to the bus parameters, "1 = Load" must be written to register 768 within 30 seconds to ensure the changes are not discarded.

Example: The table shows the register values before and after the change via bus access.

Reg.	Name	Before change	After change
764	Modbus address	246	12
765	Baud rate	0 = auto	1 = 9600
766	Transmission format	0 = 1-8-E-1	3 = 1-8-N-2
767	Bus termination	0 = Off	0 = Off
768	Bus conf. command	0 = Ready	1 = Load

## User interface



## Pushbutton operation

Action	Pushbutton operation	Feedback message
Current Modbus address (starting from lowest address position)	Button pressure < 1s	1st digit: red 2nd digit: green 3rd digit: orange The LED blinks blue once after address indication and when bus termination is On Example: 124 = 4x red, 2x green, 1x orange
Switches bus termination On/Off	<p>Switch-on</p> <ol style="list-style-type: none"> <li>1. Press button 3x</li> <li>2. Press button 1x briefly</li> <li>3. Press button until the LED turns red</li> <li>4. Release button</li> </ol> <p>Switch-off</p> <ol style="list-style-type: none"> <li>1. Press button 3x</li> <li>2. Press button until the LED turns red</li> <li>3. Release button</li> </ol>	<p>Blinking or flickering of LED stops (termination mode)</p> <p>Blue LED blinks once</p> <p>RED LED is lit (confirmation)</p> <p>LED not lit</p> <p>Address is indicated</p> <p>LED blinks blue once following address indication</p> <p>Device enters normal mode</p> <p>Blinking or flickering of LED stops (termination mode)</p> <p>RED LED is lit (confirmation)</p> <p>Device enters normal mode</p>
Enter Modbus address using pushbutton	Press button > 1s and < 5s	See "Enter address using pushbutton", page 51
Enable pushbutton addressing (together with Climatix™ controllers)	<ol style="list-style-type: none"> <li>1. Press button &gt; 5s and &lt; 10s</li> <li>2. Release button</li> </ol>	Red LED is lit and goes off after 5 s Orange LED is lit
Reset to factory settings	Press button > 10s	Orange LED blinking

## LED Farben und Blinkmuster

Color	Blinking pattern	Description
Green	1s On / 5s Off	Normal mode without bus traffic
	Flickering	Normal mode with bus traffic
Orange / green	1s orange / 1s green	Device is in override control mode
Orange	1s On / 1s Off	Bus parameter not yet configured
	1s On / 5s Off	Device is in backup mode (replacement mode)
Red	Permanently lit	Mechanical error, device blocked, manual intervention or calibration
	1s On / 5s Off	Internal error
	0.1s On / 1s Off	Invalid configuration, e.g. Min = Max
Blue	Flickering once after address indication	Bus termination active

Reset actuator with pushbutton

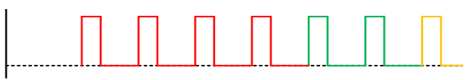
1. Press button >10s → LED blinking **orange**
2. Release button *while* blinking → LED blinking for another 3s
3. Reset is interrupted if the pushbutton is pressed *during* the 3s
4. After 3s, → LED is lit **red** (reset) while the device restarts.

### Enter address using pushbutton

The Modbus address can be set without extra tool by means of pushbutton addressing.

To display the current Modbus address, press the button <1s.

Enter new address (starting from the lowest address position)

Colors		
1st digit: <b>red</b>	2nd digit: <b>green</b>	3rd digit: <b>orange</b>
Example for address 124:		
LED		
<b>Note</b>	The address is entered and displayed beginning at the lowest digit (1st digit), see figure above. (Example: 124 starts with 4x red)	

Enter new address (starting from lowest address position)

1. **Enable addressing mode:** Press button > 1s until the LED is **red**, then release button (before LED goes off).
2. **Enter the numbers:** Push button n-times → LED blinks each time the button is pressed as a feedback.  
Colors: 1st digit: **red** / 2nd digit: **green** / 3rd digit: **orange**
3. **Save digits:** Press button until LED is lit in the color of the next digit, then release the button,
4. **Save address:** Press button until LED is **red** (confirmation) →, then release button.  
An address can be saved any time, i.e., after entering the 1st digit or after entering the 1st digit and 2nd digit.
5. The entered address is displayed again 1x for confirmation.

**Note:** Address entry is interrupted when the button is released before the LED is red, address entry is interrupted.

Example

Set address "124":

1. Enable addressing mode
2. Enter the 1st digit: Press button 4x → LED blinks **red** each time the button is pressed
3. Save 1st digit: Press button until LED is **green** – release button
4. Enter the 2nd digit: Press button 2x → LED blinks **green** each time the button is pressed
5. Save 2nd digit: Press button until LED is **orange** – release button
6. Enter the 3rd digit: Press button 1x → LED blinks **orange** each time the button is pressed
7. Save address: Press button until LED is **red** – release button  
→ The address is saved and displayed 1x for confirmation

Set address "50":

1. Enable addressing mode
2. Skip over 1st digit: Press button until LED is **green** – release button
3. Enter the 2nd digit: Press button 5x → LED blinks **green** each time the button is pressed
4. Save address (skip 3rd digit): Press button until LED is **red** – release button  
→ The address is saved and displayed 1x for confirmation

Set address "5":

1. Enable addressing mode
2. Enter the 1st digit: Press button 5x → LED blinks **red** each time the button is pressed  
Save address: Press button until LED is **red** – release button  
→ The address is saved and displayed 1x for confirmation

### 3.2.3 Maintenance

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The actuators are maintenance-free.

### 3.2.4 Disposal

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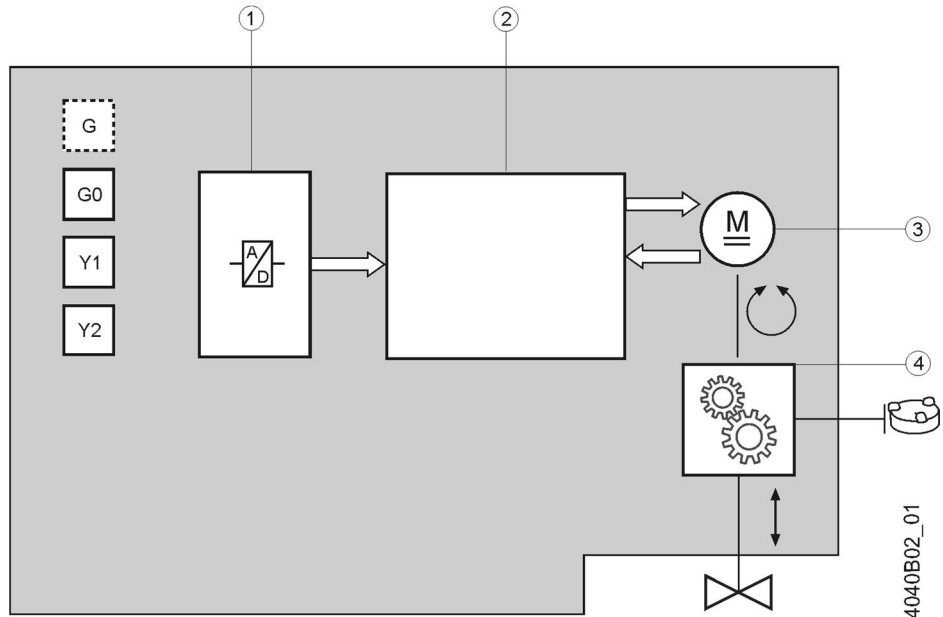


The device is considered electrical and electronic equipment for disposal in terms of the applicable European Directive and may not be disposed of as domestic garbage.

- Dispose of the device through channels provided for this purpose.
- Comply with all local and currently applicable laws and regulations.

# 4 Functions and control

## 4.1 3-position control



A 3-position signal drives the actuator via connection terminals Y1 or Y2. The required position is transferred to the valve.

1	A/D conversion	
2	Control functions	Identification of seat
		Control of direction
		Motor control
		Manual adjustment
3	Brushless DC motor	
4	Gear train	
	Manual adjuster	

Positioning signal	Stroke actuator	Rotary actuator	Control path valve A→AB	Bypass valve B → AB
Voltage at Y1	Actuator's stem extends	Actuator's spindle turns in clockwise direction	Opening	Closing
Voltage at Y2	Actuator's stem retracts	Actuator's spindle turns in counter-clockwise direction	Closing	Opening
No voltage at Y1 and Y2	Actuator's stem maintains the position	Actuator's spindle maintains the position	Maintains the position	

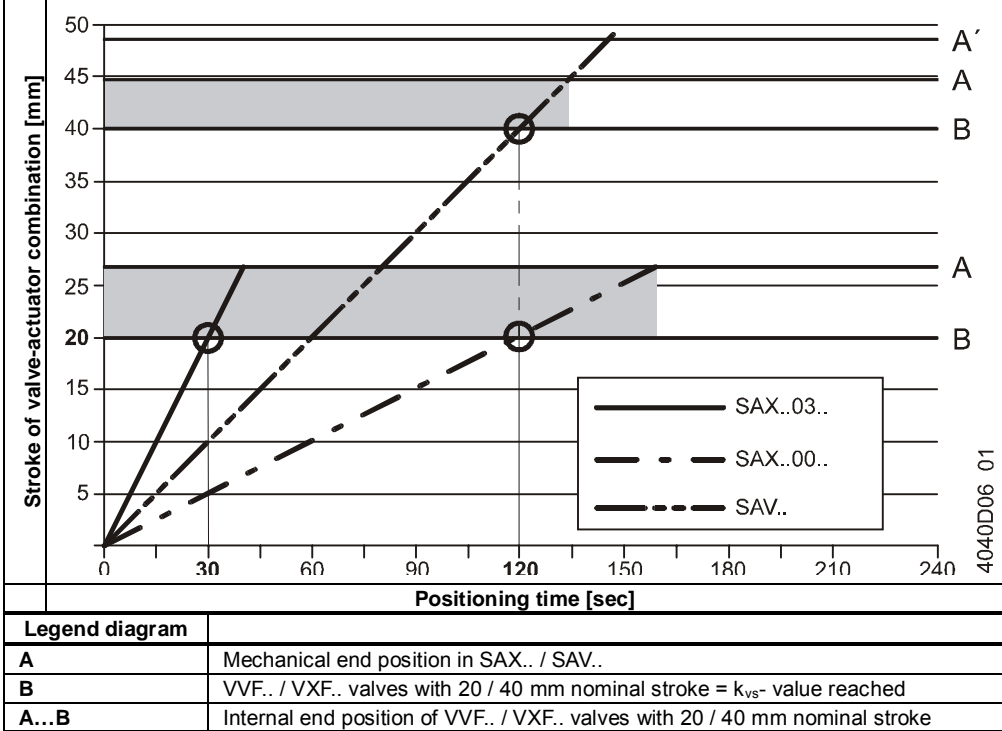
**Note**

Observe information given in chapter "Acting direction and flow characteristic" on page 61.

Internal control ensures very constant positioning times and determination of the actuator's position.

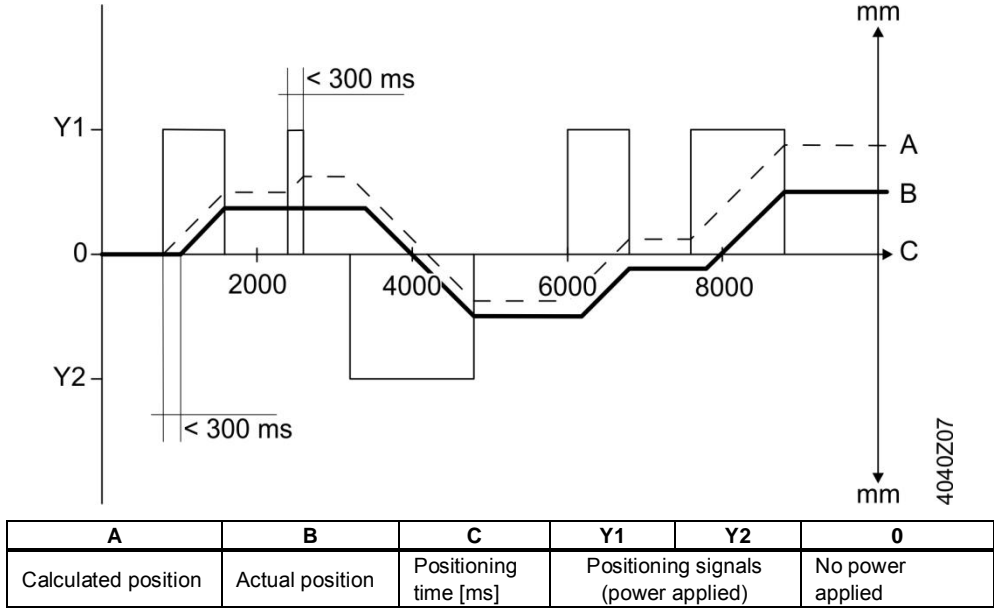
Positioning times stroke model

The specified positioning times refer to the respective nominal stroke / nominal angular rotation. Since the end positions of rotary actuators are inside the actuator, the following remarks refer to stroke actuators. The resulting effective strokes vary, depending on the type of valve, resulting in shorter or longer actuator positioning times.



Notes

- Deviations occur...
- after several positioning signals Y1 and Y2 in the same direction since the stroke movement starts with a delay of 300 ms.
  - when positioning signals Y1 and Y2 are active for less than 300 ms since the stroke movement cannot be made in that case.



Accurate position feedback is made possible with the help of a potentiometer (page 75).

### 4.1.1 Combination with RVD.. controller for direct domestic hot water distribution by heat exchanger

The design based slow reaction on control signals of SAX31.., SAX81.., SAV31.. and SAV81.. actuators doesn't allow the actuator to react on very short control pulses. Only control pulses with a length greater than 400 ms allow a sufficient reaction.

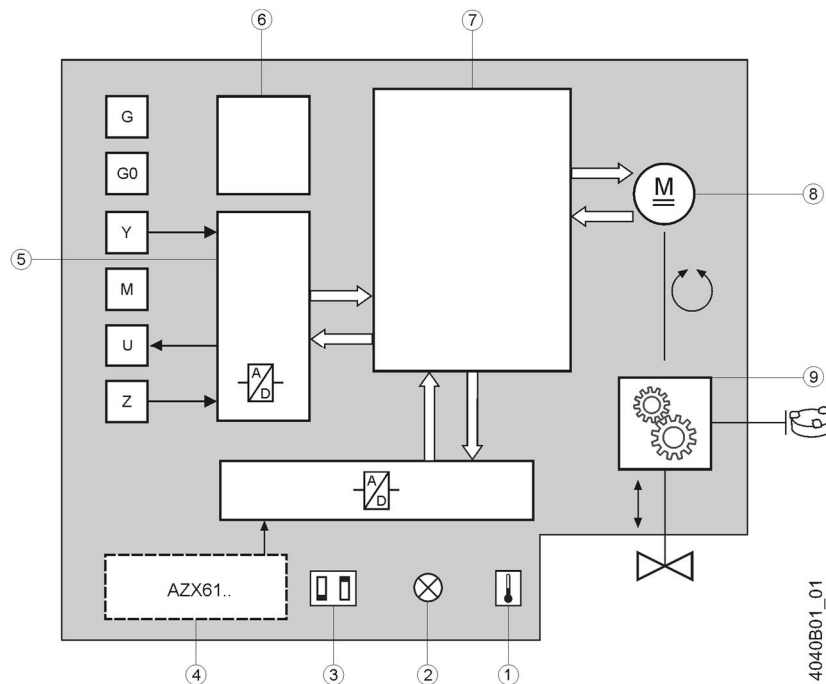
Especially the direct domestic hot water control does not allow such long control pulses. The specific optimized control loops – equipped with an SIGMAGYR RVD.. controller and Acvatix SQS359.05 actuator– work with pulses down to 40 ms.

SAX31.. and SAX81.. are not able to work with these short pulses.

The following table gives alternatives which actuators can be used within these control loops.

Controller	Plant type	Preferred actuator	Valve line	DN	kvs
RVD130 RVD135/109 RVD135/309 RVD140 RVD144/109 RVD145/109 RVD139	4 und 5	SQS35.03 SAS31.03	VVG55..	DN15 ..25	0.25 .. 6.3
		SQS359.05 SAT31.008	VVG549..	DN15 ..25	0.25 .. 6.3
		SQS359.54 SAT31.51	VVG549..	DN15 ..25	0.25 .. 6.3
		SKD32.21	VVG41.. VVF53..	DN15 ..50	0.63 .. 40 0.16 .. 40
		SKD32.21E		DN15 ..50	0.63 .. 40 0.16 .. 40
RVD230 RVD235/109 RVD250 RVD255/109 RVD240 RVD245/109 RVD260 RVD265/109	x- 4	SQS35.03 SAS31.03	VVG55..	DN15 ..25	0.25 .. 6.3
		SQS359.05 SAT31.008	VVG549..	DN15 ..25	0.25 .. 6.3
		SQS359.54 SAT31.51	VVG549..	DN15 ..25	0.25 .. 6.3
		SKD32.21	VVG41.. VVF53..	DN15 ..50	0.63 .. 40 0.16 .. 40
		SKD32.21E	VVG41.. VVF53..	DN15 ..50	0.63 .. 40 0.16 .. 40

## 4.2 Modulating control



The modulating positioning signal drives the actuator steplessly. The positioning signal range (DC 0...10 V / DC 4...20 mA, 0...1000 Ω) corresponds in a linear manner to the positioning range (fully closed...fully open, or 0...100 % stroke).

The actuator is driven via connection terminal Y or forced control Z (page 66). The required stroke / rotation is transferred to the valve's stem / spindle.

1	Calibration slot	
2	LED (2 colors)	
3	DIL switches	Changeover of characteristic
		Positioning signal
4	Function module	
5	A/D conversion	
6	Power supply	
7	Control functions	Identification of seat
		Position control
		Motor control
		Detection of foreign bodies
		Calibration
		Forced control
		Characteristics function
8	Brushless DC motor	
9	Gear train	
	Manual adjuster	

Positioning signal	Stroke actuator	Rotary actuator	Control path valve A → AB	Bypass valve B → AB
Signal Y, Z increasing	Actuator's stem extends	Actuator's spindle turns in clockwise direction	Opening	Closing
Signal Y, Z decreasing	Actuator's stem retracts	Actuator's spindle turns in counterclockwise direction	Closing	Opening
Signal Y, Z constant	Actuator's stem maintains the position	Actuator's spindle maintains the position	Maintains the position	

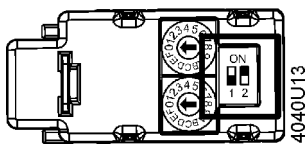
### Notes





- If function module AZX61.1 is used, observe the information given in chapter "Changeover of acting direction" (page 59).
- Observe the information given in chapter "Acting direction and flow characteristic" on page 61.



### 4.3 Function module AZX61.1

#### DIL switches




	Acting direction	Sequence control
OFF <sup>1)</sup>	 Direct acting positioning signal Y or Z	 Sequence control <b>not</b> active
ON <sup>1)</sup>	 Reverse acting positioning signal Y or Z	 Sequence control (signal adaptation)

<sup>1)</sup> Factory setting: All switches set to OFF

#### 4.3.1 Sequence control (signal adaptation)

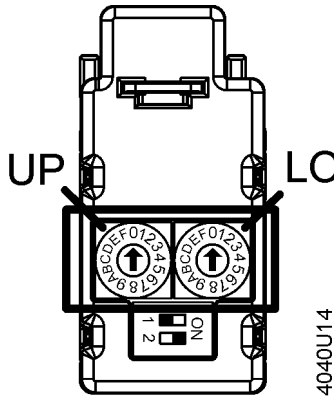
#### DIL switches

	Sequence control
ON <sup>1)</sup>	 Sequence control (signal adaptation)

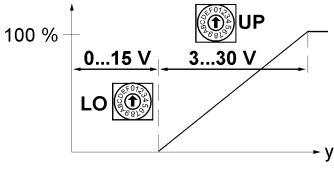
<sup>1)</sup> Factory setting: All switches set to OFF

#### HEX switches

Nr.: 1



4040U14



4040Z08

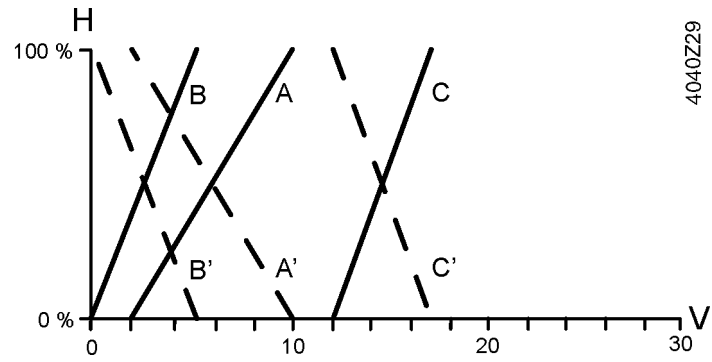
Setting sequence control			
Rotary switches LO and UP are used to set the starting point or working range of a sequence.			
Position "LO"	Starting point	Position "UP"	Working range
0	0,3 V	0	9,4 V
1	1 V	1	3 V
2	2 V	2	4 V
3	3 V	3	5 V
4	4 V	4	6 V
5	5 V	5	7 V
6	6 V	6	8 V
7	7 V	7	9 V
8	8 V	8	10 V
9	9 V	9	12 V
A	10 V	A	14 V
B	11 V	B	16 V
C	12 V	C	18 V
D	13 V	D	20 V
E	14 V	E	25 V
F	15 V	F	30 V

Invalid HEX switches combinations																
LO	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
UP		F	F	F	F	F	F	F	F	F	F	D	D	C	C	B
UP							E	E	E	E	E	E	E	D	D	C
UP												F	F	E	E	D
UP														F	F	E
UP																F



#### Notes

- Can only be used with voltage input.
- Maximum input voltage is DC 30 V. If the configuration is invalid, the actuator operates on DC 0...10 V.

Examples





4040Z29

Legend diagram	Positioning signal range	Position LO	Position UP	Position feedback U
<b>A</b>	DC 2...10 V	2	6	DC 0...10 V
<b>B</b>	DC 0...5 V	0	3	DC 0...10 V
<b>C</b>	DC 12...17 V	C	3	DC 0...10 V
<b>H</b>	Stroke or rotary angle			
	Acting direction: Direct (A, B, C)			
	Acting direction: Reverse (A', B', C')			

### 4.3.2 Changoever of acting direction

#### DIL switches

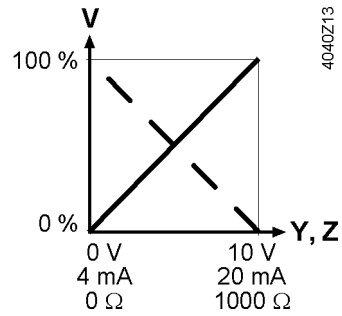
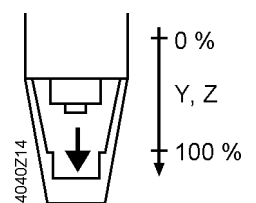
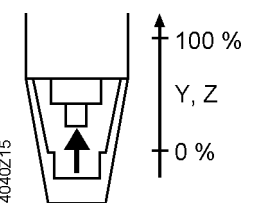


Acting direction	
<b>OFF</b> <sup>1)</sup>  Direct acting positioning signal Y or Z	<b>ON</b> <sup>1)</sup>  Reverse acting positioning signal Y or Z

<sup>1)</sup> Factory setting: All switches set to OFF

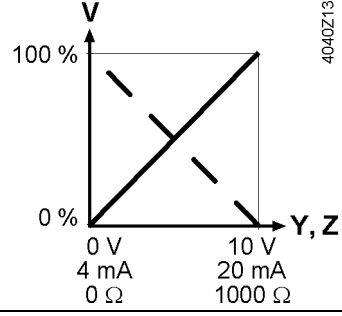
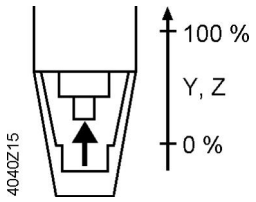
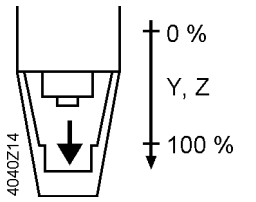
#### Selecting the acting direction

- With valves whose stem is extended in the fully closed position, "direct acting" means that the valve is fully closed (0 %) when positioning signal Y = 0 V resp. Z = 0 Ω. This applies to all Siemens valves according to "Equipment combinations" (page 14).
- With valves whose stem is retracted in the fully closed position, "direct acting" means that the valve is fully open (100 %) when positioning signal Y = 0 V resp. Z = 0 Ω.

#### SAX61.03 SAV61.00

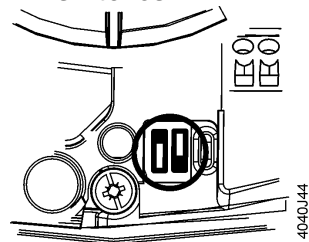
		Direct acting	Reverse acting
	4040Z13		
		Positioning signal Y: DC 0...10 V Positioning signal Z: 0...1000 Ω	Positioning signal Y: DC 0...10 V Positioning signal Z: 4...20 mA 0...1000 Ω
Y, Z	Positioning signal		
V	Volumetric flow		
	Acting direction: Direct		
	Acting direction: Reverse		

#### SAY61P03 SAX61P03 SAV61P00

		Reverse acting	Direct acting
	4040Z13		
		Positioning signal Y: DC 0...10 V Positioning signal Z: 0...1000 Ω	Positioning signal Y: DC 0...10 V Positioning signal Z: 4...20 mA 0...1000 Ω

## 4.4 Positioning signal and flow characteristic selection

DIL switches



	Positioning signal "Y"	Position feedback "U"	Flow characteristic	
OFF <sup>1)</sup>	 DC 0...10 V	DC 0...10 V	 log = equal-percentage	
ON	 DC 4...20 mA	DC 0...10 V	 lin = linear	

<sup>1)</sup> Factory setting: All DIL switches set to OFF  $\Omega$

Flow characteristic  
SAX61.03 / SAV61.00  
with VVF..

	Actuator	Valve VVF.. / VVG41..	Totally
log			
lin			

Flow characteristic  
SAY61P03 / SAX61P03 /  
SAV61P00 with VPF..

	Actuator	Combi-Valve VPF43/VPF53	Totally
log			
lin			
Y, Z	Positioning signal		
H	Stroke		
V	Volumetric flow		
————	Acting direction: Direct		
- - - -	Acting direction: Reverse		

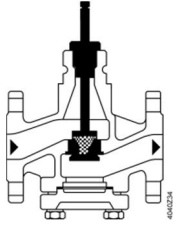
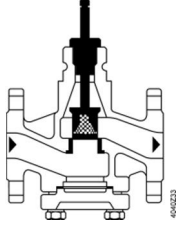


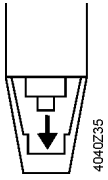
### Note

SAX61.03/MO: Positioning signal and flow characteristic selection are not permissible

## 4.5 Acting direction and flow characteristic


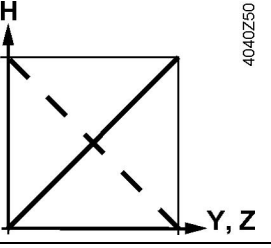
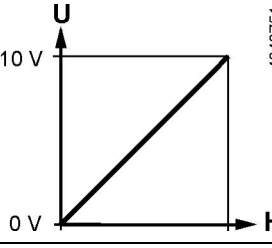

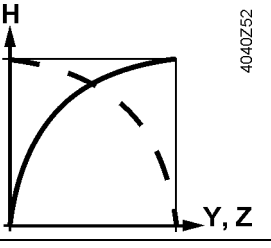
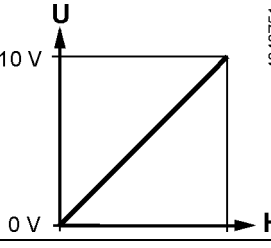
The selection of changeover of acting direction and characteristic with the DIL switches depends on the type of actuator (with or without fail safe function) and the associated type of valve (valve characteristic, push to open, pull to open).

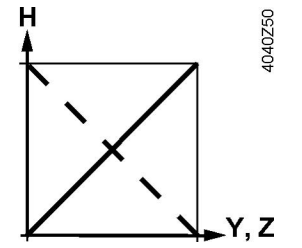
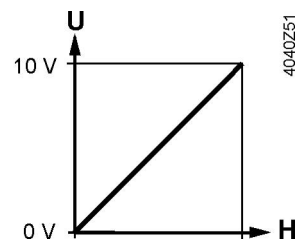
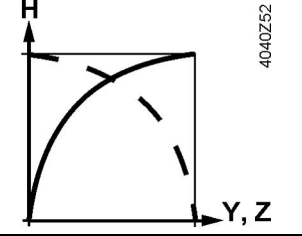
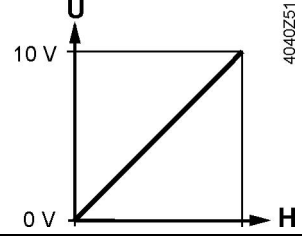
When the positioning signal increases (DC 0...10 V, DC 4...20 mA, 0...1000 Ω), the objective is to have the valve's volumetric flow  $V$  rising, but to fully open the valve,  $V = 100\%$  (NO = normally open), or to fully close it,  $V = 0\%$  (NC = normally closed) in the event of a power failure.

						
						
	<b>DIL switches</b>	<b>Acting direction</b>	Direct		Reverse	
		<b>Flow characteristic</b>	Linear	Equal-percentage	Linear	Equal-percentage
	<b>Without fail safe function</b>	<b>No power applied</b>	Maintains the position			

## 4.6 Position Feedback U

The position feedback  $U$  (DC 0...10 V) is always proportional to stroke  $H$  of the actuator's stem.

		Actuator Positioning signal Y, Z	Actuator Position feedback U
	log = equal-percentage		
	lin = linear		

	Actuator Positioning signal Y, Z	Actuator Position feedback U
Direct acting		
Reverse acting		
Y, Z	Positioning signal	
H	Stroke	
U	Position feedback	
—————	Acting direction: direct	
- - - - -	Acting direction: reverse	

## 4.7 Position control with ClosedPosition-Synchronisation

Within SAX/SAV/SAL61/SAY61.. actuators the position control works based on the HALL-sensor pulses from the brushless DC-motor calculating with an internal stroke model calculating the actual position. This kind of control is more accurate and wearless compared with a physical element for position measurement and grants a precise position control with high resolution.

During manual operation the motor is declutched from the gear train and the internal position control get's not sensor pulses. So real position will deviate from the internally calculated position. As a consequence the position feedback on terminal U is set to "0V" during manual operation.

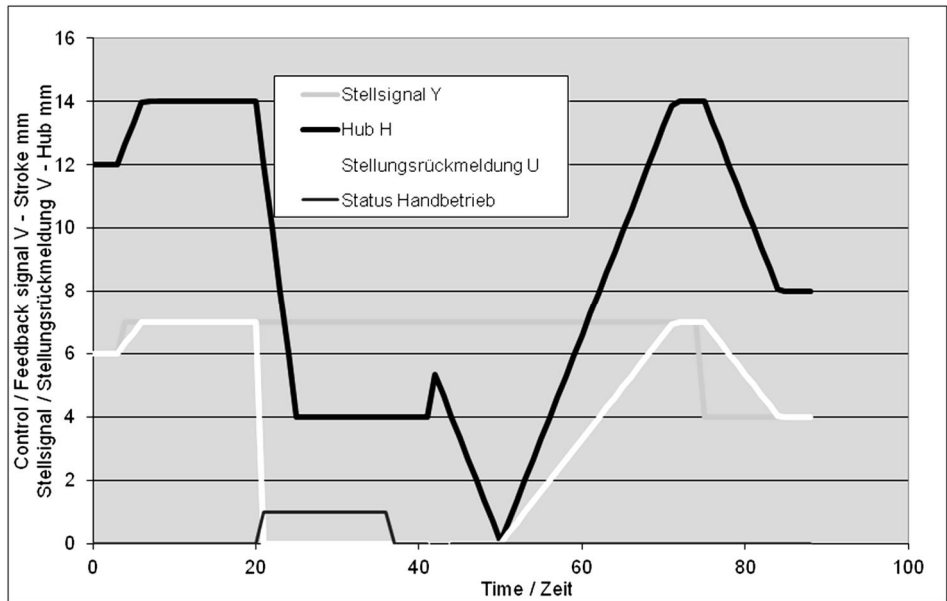
To grant – after manual operation – that real mechanical position and internal position control are matching all SA..61.. operate after manual operation an automatic ClosedPosition-Synchronisation.

### 4.7.1 ClosedPosition-Synchronisation

Returned into automatic operation the actuator runs for 0.5.. 2 s into opening direction to grant secure closed-position detection. Then the actuator runs into closed position (seat A-AB in the valve). Reaching the closed position the internal stroke model is synchronized. Positioning signal, position feedback and meachnical position now match perfectly again.

With this function it's granted that the position feedback U – which was zero during manual operation and synchronization - always represents the real mechanical position of the actuator.

After synchronization the actuator follows the control signal again.



#### 4.7.1.1 Active forced position input on Z

If after return to automatic mode a signal on Z is active (GND, AC/DC 24 V or 0...1000 Ohm) the ClosedPosition-Synchronisation is deactivated as long as the signal on Z remains.

After Z is deactivated the ClosedPosition-Synchronisation will be performed.

Note

ClosedPosition-Synchronisation is only automatically activated after manual operation. A power failure does not activate this function automatically, to avoid that all actuators in a section close in parallel.

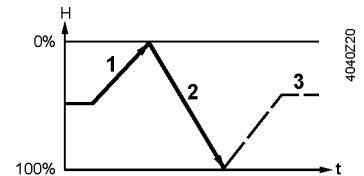
If the customer likes synchronization also after a power failure he should take care that the plant restarting routine drives the actuator automatically into an end position. This will also synchronise the internal position control and the real position.

## 4.8 Calibration

To match the actuator to production-related mechanical tolerances of the individual valves, accurate positioning and position feedback must be ensured, if calibration is performed when the plant is commissioned (page 46). During commissioning, the actuator detects the valve's end positions and files the exact stroke in its internal memory.

Calibration takes place in the following phases:

- Actuator drives to  $H_0$  (1), valve closes. Detection of upper end position.
- Actuator drives to  $H_{100}$  (2), valve opens. Detection of lower end position.
- The detected values are stored (3). Then the actuator follows the positioning signal.




Note

- Observe status indication (LED) during and after calibration (page 74).
- If the actuator does not detect the second end position within an appropriate stroke range (SAX.., SAY.. max. 25 mm; SAV.. max. 45 mm), the first end stop will be adopted and the actuator operates with a working range of 20 mm, respectively 40 mm.

## 4.9 Signal priorities

The actuators are controlled via different interlinked positioning signal paths (positioning signal "Y", forced control input "Z", manual adjuster). The signal paths are assigned the following priorities:

Priority	Description	
1 (highest)	The manual adjuster always has priority 1, thus overriding all signals active at "Z" or "Y", independent of whether or not power is applied.	
2	Only SA..61..: As soon as a valid positioning signal is active at input "Z", the position is determined via positioning signal "Z" (forced control). Prerequisite: The manual adjuster is not used.	<b>Z</b>
3 (lowest)	The position is determined via positioning signal "Y". The manual adjuster is not used and on Z there is no active signal.	<b>Y</b>

Examples

Manual adjuster	Forced control (Z)	Positioning signal (Y)	Stroke actuator	Rotary actuator
Automatic mode	Not connected	<b>5 V</b>	Actuator's stem travels to position (50%)	Actuator's spindle travels to position (50%)
Automatic mode	<b>G</b>	3 V	Actuator's stem extends	Actuator's spindle turns in clockwise direction
Automatic mode	<b>G0</b>	3 V	Actuator's stem retracts	Actuator's spindle turns in counter-clockwise direction
<b>Operated (30%) and engaged</b>	G	8 V	Actuator's stem retracts manual (to 30%)	Actuator's spindle turns manual in counterclockwise direction (to 30%)

Bold printing = positioning signal currently active



## 4.10 Detection of valve seat

The actuators feature force-dependent valve seat detection. After calibration, the exact valve stroke is filed in the actuator's memory. When the actuator reaches the respective end of stroke, it does not hit the valve's seat at full speed, but stops for 5 seconds at about 1% before the stored position is reached. If the positioning signal stays at 0% or 100%, the actuator travels to the calculated end position at reduced positioning speed and builds up the required nominal force.

This function extends the actuator's service life since the dynamic forces are reduced when approaching the valve seat and there will be less strain on the gear train.

In addition, the actuator's oscillations in the case of instable control are suppressed.

If no force is built up in the calculated end position (e.g. in the event of temperature effects for instance), the actuator continues to operate at a reduced positioning speed until the nominal positioning force is restored. This ensures that the valve always fully closes.

After a power failure, valve seat identification is not active – the actuators define their stroke position on power resoration to be at 50%. From now on, the actuator follows the positioning signal.

When the valve plug reaches its seat for the first time, the actuator readjusts its stroke model.

### Example

The supposed position is 50%,  $Y = 2 V$ , the actuator travels 30% of the stored valve stroke in the direction of "Actuator's stem retracted".

If the actuator reaches the seat within this 30% travel, it interprets the position as "Valve fully closed" and shifts the position of the valve's stroke accordingly without changing the extent of travel.

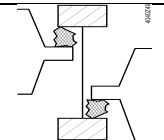
From now on, the actuator follows the changed valve stroke position.

This means: New position 0%,  $Y = 2 V$ , actuator travels 20% of the stored valve stroke in the direction "Actuator's stem extended".

## 4.11 Detection of foreign bodies

The actuator detects when the valve is clogged and adjusts its operational behavior accordingly to prevent damage to itself or the valve.

If the actuator hits an obstacle within the calibrated stroke and is not able to overcome it with its nominal positioning force, it stores the position at which the obstacle was hit. Depending on the direction of travel, as ...

- |  |   |
|--|---|
| <ul style="list-style-type: none"><li>• "Lower limit of valve clogging", if the clogging was detected when traveling in the direction of "Actuator's stem retracting".</li></ul> |  |
| <ul style="list-style-type: none"><li>• "Upper limit of valve clogging", if the clogging was detected when traveling in the direction of "Actuator's stem extending".</li></ul>  |   |

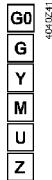

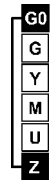
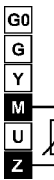
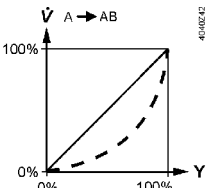
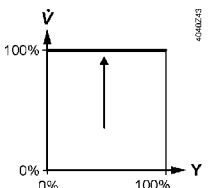
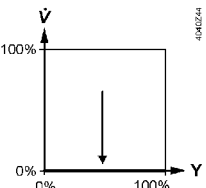
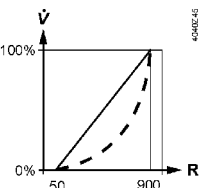
Now, the status LED blinks green and the actuator only follows the positioning signal between the positions "Actuator's stem retracted" and "Upper limit of valve clogging" or "Actuator's stem extended" and "Lower limit of valve clogging".

After detection of clogging, 3 attempts are made to overcome clogging by traveling about 15% in the opposite direction and then trying again to overcome the position of clogging. If the attempts made are unsuccessful, the actuator continues to follow the positioning signal within the restricted range only and the LED continues to blink green (refer to "Indicators" on page 74).

## 4.12 Forced control Z

SA..61.. only

Forced control is affected by changeover of acting direction. It uses the following operating modes:

		Z-mode			
		No function	Fully open	Fully closed	Overriding positioning signal "Y" by 0...1000 Ω
Connections					
	Transmission				
	Equal-percentage or linear characteristic				Equal-percentage or linear characteristic
	Contact "Z" not connected, valve follows positioning signal "Y"	Contact "Z" is connected directly to "G", positioning signal "Y" has no impact	Contact "Z" is connected directly to "G0", positioning signal "Y" has no impact	Contact "Z" is connected to "M" via resistor "R", starting point at 50 Ω, end point at 900 Ω, positioning signal "Y" has no impact	

Note

The operating modes "Z" shown are based on factory setting "direct acting" and a "push to open" valve.

## 4.13 Communicating actuators Modbus RTU

### 4.13.1 Detection of valve seat

The actuators feature force-dependent valve seat detection. After calibration, the exact valve stroke is filed in the actuator's memory. When the actuator reaches the respective end of stroke, it does not hit the valve's seat at full speed, but stops for 5 seconds at about 1% before the stored position is reached. If the positioning signal stays at 0% or 100%, the actuator travels to the calculated end position at reduced positioning speed and builds up the required nominal force.

This function extends the actuator's service life since the dynamic forces are reduced when approaching the valve seat and there will be less strain on the gear train.

In addition, the actuator's oscillations in the case of instable control are suppressed.

If no force is built up in the calculated end position (e.g. in the event of temperature effects for instance), the actuator continues to operate at a reduced positioning speed until the nominal positioning force is restored. This ensures that the valve always fully closes.

After a power failure, valve seat identification is not active – the actuators without fail safe function define their stroke position upon return of power at 50%. And sets its internal setpoint in register 1 to 0%. The actuator closes at this setting. There is a short-term deviation between the setpoint and the internal stroke position that results in an error message in register 769 "Mechanical error, device blocked". The error message disappears after just a few seconds.

When the valve plug reaches its seat for the first time, the actuator readjusts its stroke mode.

#### Example

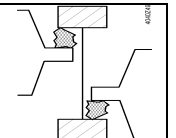
Setpoint prior to power outage 35%, no manual adjustment during the power outage. Internal stroke position value after return of power 50%. Internal setpoint after return of power 0%. There is an error message for a brief time prior to the actuator moving since the setpoint of 0% is not equal to the position feedback of 50%. The error message disappears as soon as the actuator moves. The actuator moves 35% in the direction of "Retract actuator stem" and reaches the valve seat. The internal stroke position is set to 0%.

The actuator now follows the changed valve stroke position effective immediately.

### 4.13.2 Detection of foreign bodies

The actuator detects when the valve is clogged and adjusts its operational behavior accordingly to prevent damage to itself or the valve.

If the actuator hits an obstacle within the calibrated stroke and is not able to overcome it with its nominal positioning force, it stores the position at which the obstacle was hit. Depending on the direction of travel, as ...

- |  |   |
|--|---|
| <ul style="list-style-type: none"><li>• "Lower limit of valve clogging", if the clogging was detected when traveling in the direction of "Actuator's stem retracting".</li></ul> |  |
| <ul style="list-style-type: none"><li>• "Upper limit of valve clogging", if the clogging was detected when traveling in the direction of "Actuator's stem extending".</li></ul>  |   |

Now, the status LED blinks green and the actuator only follows the positioning signal between the positions "Actuator's stem retracted" and "Upper limit of valve clogging" or "Actuator's stem extended" and "Lower limit of valve clogging".

After detection of clogging, 3 attempts are made to overcome clogging by traveling about 15% in the opposite direction and then trying again to overcome the position of clogging. If the attempts made are unsuccessful, the actuator continues to follow

the positioning signal within the restricted range only and the LED continues to blink green (refer to "Indicators" on page 74).

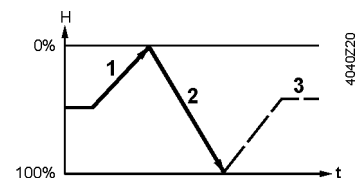
As long as the external setpoint is greater than the position of the high limit valve clogging, the deviation between the setpoint and position feedback in register 769 is displayed with the warning "Mechanical error, device blocked, manual intervention or calibration." The LED on the cable adapter is red. The warning is reset if the external setpoint drops below the high limit valve clogging, since the setpoint and stroke position are once again the same. The LED on the cable adapter switches to green blinking (=communication).

### 4.13.3 Calibration

To match the actuator to production-related mechanical tolerances of the individual valves, accurate positioning and position feedback must be ensured, if calibration is performed when the plant is commissioned (page 46). During commissioning, the actuator detects the valve's end positions and files the exact stroke in its internal memory.

Calibration takes place in the following phases:

- Actuator drives to  $H_0$  (1), valve closes. Detection of upper end position.
- Actuator drives to  $H_{100}$  (2), valve opens. Detection of lower end position.
- The detected values are stored (3). Then the actuator follows the positioning signal.
- If the actuator does not detect the second end position within an appropriate stroke range (max. 25 mm), the first end stop will be adopted and the actuator operates with a working range of 20 mm.



The internal position feedback is set to 0% during calibration. For a setpoint  $> 0\%$ , the actuator detects calibration based on the deviation between setpoint and stroke position and reports this in Register 769 with the warning "Mechanical error, device blocked, manual intervention or calibration". The LED on the actuator cover blinks green, the LED on the cable adapter is red.

After calibration is completed, the actuator follows the external setpoint, the warning is reset, the LED on the cover changes to continuous green and the cable adapter blinks green (communication active).

Note

Observe status indication (LED) during and after calibration (page 74).

### 4.13.4 Manual adjustment

The actuator's internal stroke position measurement is inactive during manual adjustment.

The position feedback changes to 0% once the manual adjuster is pressed and remains on the value during manual adjustment. The actuator detects manual action based on the deviation between the setpoint and the stroke position and reports in register 769 with the warning "Mechanical error, device blocked, manual intervention or calibration". The LED on the actuator cover blinks green, the LED on the cable adapter is red.

Upon return to automatic mode, the actuator synchronizes to stroke position 0%. After the synchronization, the actuator follows the pending setpoint, the LED on the cover changes to continuous green and, on the cable adapter, blinking green (communication active). The warning in register 769 is reset.

### 4.13.5 Parameters and function description

Reg.	Name	R/W	Unit	Scaling	Range / listing
<b>Process values</b>					
1	Setpoint	RW	%	0.01	0..100
2	Forced control	RW	--	--	0 = Off / 1 = Open / 2 = Close 3 = Stop / 4 = Min / 5 = Max
3	Actual value position	R	%	0.01	0..100
256	Command	RW	--		0 = Ready / 1 = Adaption / 2 = Self test 3 = Reinitialize / 4 = Remote reset

<b>Parameters</b>					
259	Op mode	RW	--	--	1 = POS
260	MinPosition	RW	%	0.01	0..100
261	MaxPosition	RW	%	0.01	0..100
262	Actuator runtime	R	s	1	30
263	Positioning signal characteristic between Y and U	RW	--	--	0 = Linear (e.g. SAX61../MO + V_G41) 1 = Logarithmic (e.g. SAS61../MO + V_G44)
264	Tolerance blockade monitoring	RW	%	0.01	0..10
513	Backup mode	RW	--	--	0 = Move to backup position 1 = Maintain last position / 2 = Disable
514	Backup position	RW	%	0.01	0..100
515	Backup timeout	RW	s	1	0..65535
516	Startup setpoint	RW	%	0.01	0..100
764	Modbus address	RW	--	--	1..247 / 255 = "unassigned"
765	Baud rate	RW	--	--	0 = auto / 1 = 9600 / 2 = 19200 3 = 38400 4 = 57600 / 5 = 76800 / 6 = 115200
766	Transmission format	RW	--	--	0 = 1-8-E-1 / 1 = 1-8-O-1 / 2 = 1-8-N-1 / 3 = 1-8-N-2
767	Bus termination	RW	--	--	0 = Off / 1 = On
768	Bus config. command	RW	--	--	0 = Ready / 1 = Load / 2 = Reject
769	Status	R	--	--	See Section, Register 769 "Status"

Reg.	Name	R/W	Value	Example																				
<b>Device information</b>																								
1281	Factory Index	R	Two bytes, each coding an ASCII char.	00 5A → 00 "Z" Device is of Series "Z"																				
1282	Factory Date HWord	R	Two bytes, the lower coding the Year (hex)	Read 1282 → 000F Read 1283 → 0418																				
1283	Factory Date LWord	R	High byte: coding the month (hex) Low byte: coding the day (hex)	<table border="1"> <thead> <tr> <th></th> <th colspan="2">HWord</th> <th colspan="2">LWord</th> </tr> <tr> <th></th> <th>--</th> <th>YY</th> <th>MM</th> <th>DD</th> </tr> </thead> <tbody> <tr> <td>Hex</td> <td>00</td> <td>0F</td> <td>04</td> <td>18</td> </tr> <tr> <td>Dec</td> <td>00</td> <td>15</td> <td>04</td> <td>24</td> </tr> </tbody> </table> → Device was manufactured 24 April, 2015		HWord		LWord			--	YY	MM	DD	Hex	00	0F	04	18	Dec	00	15	04	24
	HWord		LWord																					
	--	YY	MM	DD																				
Hex	00	0F	04	18																				
Dec	00	15	04	24																				
1284	Factory SeqNo HWord	R	Hword + LWord = HEX-representation of Sequence number:	Read 1284 → 000A																				
1285	Factory SeqNo LWord	R		Read 1285 → A206 AA206(hex) → 696838 (dec) → Device has sequence number 696838																				
1409	ASN [Char_16..15]	R	Each register: Two bytes, each coding an ASCII char. ASN is coded beginning with reg. 1409	Example: 0x47 44 = GD 0x42 31 = B1 0x38 31 = 81 0x2E 31 = .1 0x45 2F = E/ 0x4D 4F= MO → ASN is GDB181.1E/MO																				
1410	ASN [Char_14..13]	R																						
1411	ASN [Char_12..11]	R																						
1412	ASN [Char_10..9]	R																						
1413	ASN [Char_8..7]	R																						
1414	ASN [Char_6..5]	R																						
1415	ASN [Char_4..3]	R																						
1416	ASN [Char_2..1]	R																						
				Reserve																				

## Register 769 "Status"

Status			
Bit 00	1 = Reserved	Bit 06	1 = Adaption conducted
Bit 01	1 = Backup mode active	Bit 07	1 = Adaption running
Bit 02	1 = Reserved	Bit 08	1 = Adaption error
Bit 03	1 = Reserved	Bit 09	1 = Self test failed
Bit 04	1 = Mechanical error, device blocked, manual intervention or calibration	Bit 10	1 = Self test successful
Bit 05	1 = Life cycle reached	Bit 11	1 = Invalid configuration

## Supported function codes

Function codes	
03 (0x03)	Read Holding Registers
04 (0x04)	Read Input Registers
06 (0x06)	Write Single Register
16 (0x10)	Write Multiple Registers (Limitation: Max. 120 registers on one write access)

Function	Reg.	Description
Override control	2	<p>The actuator can be operated in override control for commissioning / maintenance purposes or system-wide functions (e.g. night-cooling).</p> <ul style="list-style-type: none"> <li>Manual override: When the gear disengagement is used to freely adjust the damper position, a mechanical jam will be detected if a mismatch between setpoint and actual position persists for more than 10s.</li> <li>Remote override: The actuator enters this state when an override command is sent over the bus.</li> <li>Available commands: <ul style="list-style-type: none"> <li>Open / Close (depends on opening direction)</li> </ul> </li> </ul>

		<ul style="list-style-type: none"> <li>○ Min / Max (depends on Min/Max settings)</li> <li>○ Stop</li> </ul>
Backup mode	513, 514, 515	<ul style="list-style-type: none"> <li>● In case the communication to the controller is lost, the device can be configured to go into a defined state.</li> <li>● Default setting mode is "keep last setpoint", i.e. in case of communication loss, the device controls to the last received setpoint.</li> <li>● If the backup mode is enabled, it can be configured as follows: <ul style="list-style-type: none"> <li>○ go to a predefined backup position</li> <li>○ keep current position</li> </ul> </li> </ul>
Restarting the device	256	Restarting is possible by: <ul style="list-style-type: none"> <li>● Power-reset (turning operating voltage off and on) or</li> <li>● by "RelnitDevice" command.</li> </ul> → Device re-initializes and sets all process values to defaults.
Reset		The actuator supports the following re-initialization / reset behaviour: <ul style="list-style-type: none"> <li>● Local reset by push-button</li> <li>● Remote reset: Using "RemoteFactoryReset" command.</li> </ul> Effect of reset: Process values: set to ex-works default values. <ul style="list-style-type: none"> <li>● Parameters: <ul style="list-style-type: none"> <li>○ Application and actuator parameters are set to factory defaults,</li> <li>○ Network parameters are reset only in case of local reset, not by remote reset (otherwise loss of communication).</li> </ul> </li> <li>● Not reset are: Counters, status flags, device info, and factory data.</li> </ul>
Self test	256	When triggered, the self test drives the actuator to the detected limits and sets the flags in register 769 according to the result (bit 09 = 1 → "failed" or bit 10 = 1 → "passed"). The self test is not passed when the limits were not reached from the lower end (results in jam). If the Min/Max limits can be exceeded, the self test is not evaluated as failed.

## Communication properties

Communication		
Communications protocol	Modbus RTU	RS-485, not galvanically separated
	Number of nodes	Max. 32
	Address range	1...247 / 255 Factory settings: 255
	Transmission formats	1-8-E-1 / 1-8-O-1 / 1-8-N-1 / 1-8-N-2 Factory settings: 1-8-E-1
	Baud rates (kBaud)	Auto / 9,6 / 19,2 / 38,4 / 57,6 / 76,8 / 115,2 Factory settings: Auto
	Bus termination	120 Ω electronically switchable Factory settings: Off

## 4.14 Technical and mechanical design

### 4.14.1 Transmission of power

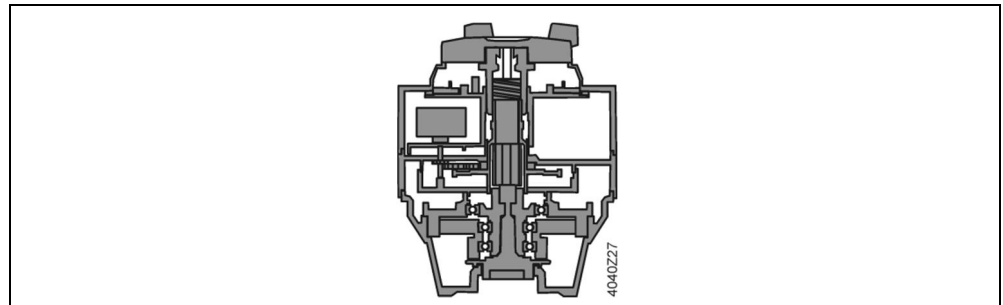
#### Function principle

Incoming positioning signals are translated to positioning commands for the motor.

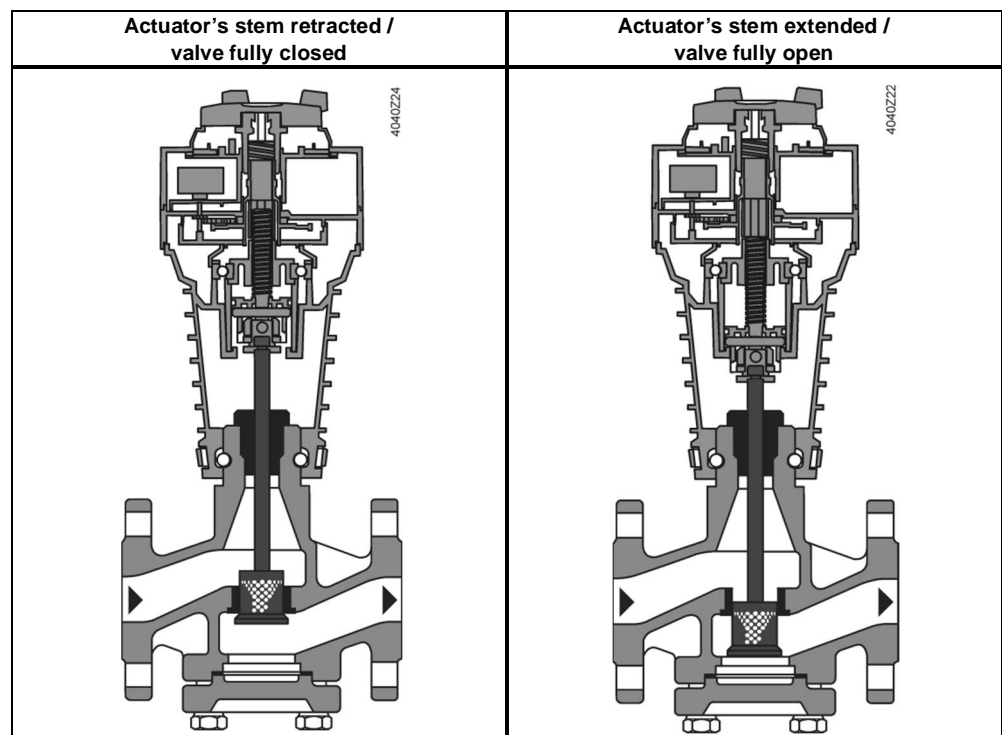
A gear train transmits the motor's positioning steps to the output stage (valve coupling). Attached to the gear train are the electrical and mechanical accessory items and the manual adjuster.

In the case of the rotary actuators, the adjustment to the required torque is made in the output stage. With the stroke actuators, the translation from rotary to stroke movement takes place in the output stage.

SAL..

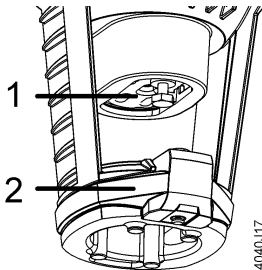
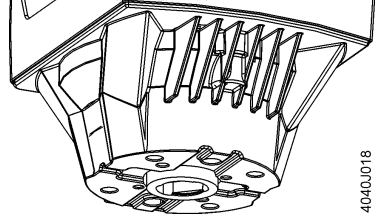


SAX..., SAV..



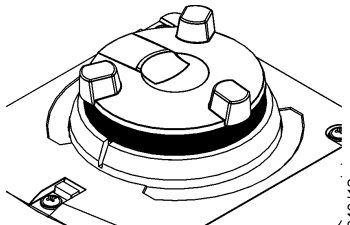


## 4.14.2 Coupling

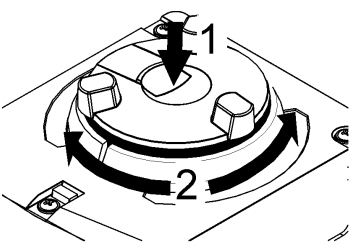
SAX..., SAV..	SAL..
	
<p>The stem coupling (1) and neck coupling (2) ensures full backward compatibility with all types of Siemens large-stroke valves produced since 1975.</p>	<p>Mounting sets are available for use with butterfly and slipper valves.</p>

## 4.14.3 Manual adjuster

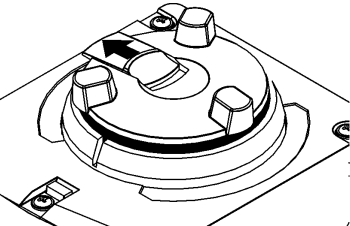
### Automatic

	<p>When the motor drives the manual adjuster turns. Thus in automatic mode, the manual adjuster is used for indication of travel. If the manual adjuster is held firm in this mode, there is no transmission of power to the gear train.</p>
--	--

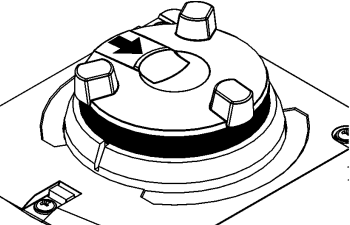
### Manual operation

	<p>When pushing the manual adjuster down (1), it engages and the actuator can be manually operated.</p> <p>Stroke actuator: When turning the manual adjuster in clockwise / counterclockwise direction (2), the actuator's stem retracts / extends.</p> <p>Rotary actuator: The actuator spindle turns in the same direction.</p> <p>An overload protection prevents damage to the manual adjuster</p>
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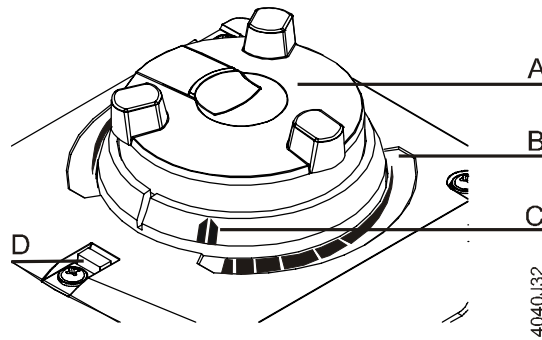
### Fixing the position

	<p>Upon actuation and locking the slide switch, the manual adjuster remains engaged.</p> <p>When in this mode, do not turn the manual adjuster.</p>
---	---

### Disengaging the fixing

	<p>When resetting the slide switch, the manual adjuster returns to automatic mode.</p> <p>-&gt;The modulating SA..61.. will automatically start a Zero Position Synchronisation</p>
---	---

## 4.14.4 Indicators



A	Indication of travel	
B	Scale	Position indication
C	Indicator	
D	LED Status indication	

### Operational status indication

In Automatic mode, the manual adjuster serves for the indication of travel. See "Automatic" (page 73).

### Position indication

Position indication is on 2 opposite sides. When turning the manual adjuster, the indicator moves in the same direction.

The scale indicates the stroke. When reaching the stops, the valve is either fully open or fully closed.

### Status indication (LED)

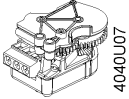
Housing cover fitted	Housing cover removed
<p style="text-align: right;">4040J34</p>	<p style="text-align: right;">4040J33</p>
When the housing cover is fitted, the LED can be viewed through a light conductor.	When the housing cover is removed, the LED can be viewed through a hole.

The status indication informs about the operational state of the actuator.

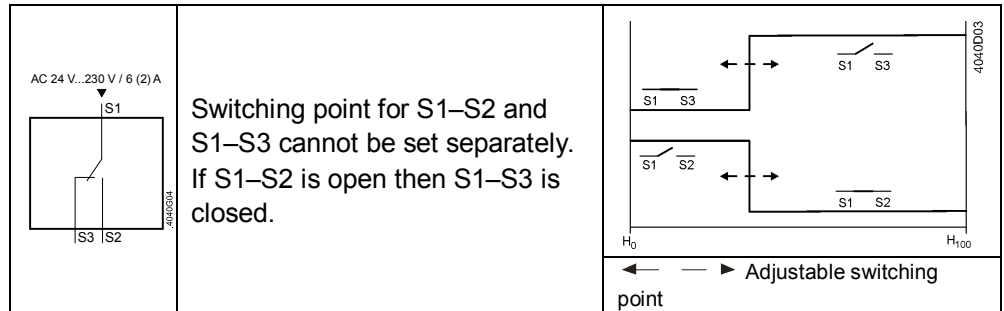
LED	Indication	Operating state	Remarks, troubleshooting
Green	On	Automatic mode	Normal operation
	Blinking	Calibration (page 46).	Wait until calibration is finished (then green or red light)
		In manual mode	Manual adjuster in MAN position
		Detection of foreign bodies (page 65)	Check valve / actuator
Red	On	Calibration error	Start calibration again (page 46)
	Blinking	Clogged valve	Check valve
Dark	Dark	No power or electronics faulty	Check operating voltage

## 4.14.5 Electrical accessories

### Auxiliary switch ASC10.51



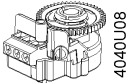
The auxiliary switch ASC10.51 switches on or off when a certain position is reached. The switching point can be set between 0...100%.



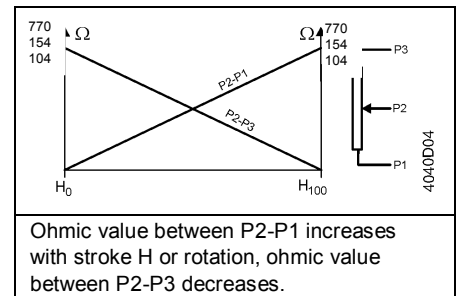
Application example:

When using an auxiliary switch, position feedback can trigger an automatic stop of the circulating pump in the end position "Fully closed".

### Potentiometer ASZ7.5/..



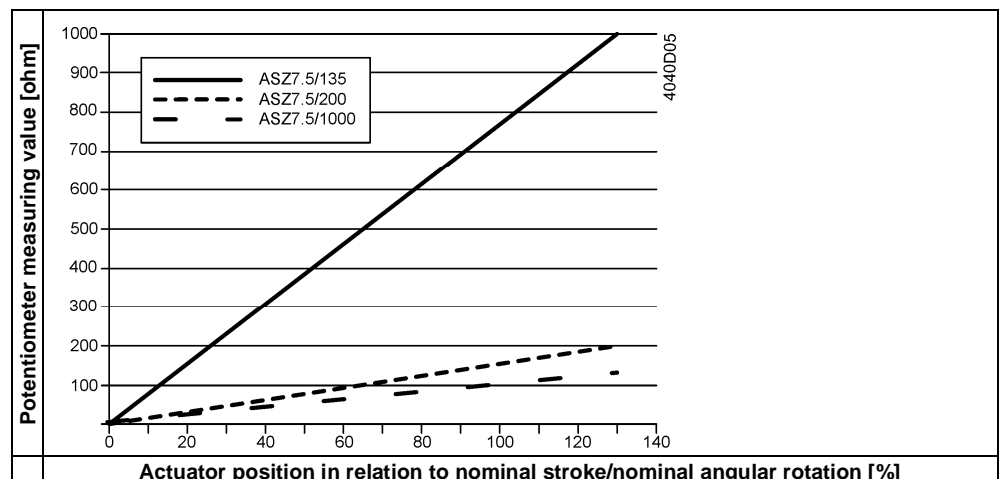
Potentiometer ASZ7.5 delivers an ohmic value to the controller giving the exact position of the actuator (continuous position feedback). A slip clutch prevents damage to the potentiometer in the mechanical end positions. This is also used for accurate balancing of the potentiometer in the fully closed position.



Flow characteristic

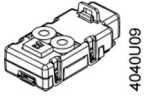
The end values of the potentiometers refer to the maximum stroke / maximum angular rotation of the actuators. For this reason, the resulting values in operation deviate, depending on the type of valve used in combination with the actuator. The potentiometer's starting point can be very accurately adjusted during installation (refer page 37).

	ASZ7.5
	770 Ohm at nominal stroke/nominal angular rotation
	$R = 0 + 7.7 \text{ Ohm} \times \text{nominal stroke/nominal angular rotation (\%)}$
SAX..	$R = 0 + 38.5 \text{ Ohm} \times \text{stroke (mm)}$
SAV..	$R = 0 + 19.3 \text{ Ohm} \times \text{stroke (mm)}$
SAL..	$R = 0 + 8.55 \text{ Ohm} \times \text{rotary angle (}^\circ\text{)}$



## Function module

### AZX61.1

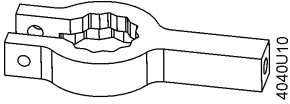


Function module AZX61.1 offers the following choices for changing control:

- Changeover of acting direction (page 59)
- Sequence control (page 57)

## Stem heating element

### ASZ6.6



Stem heating element ASZ6.6 prevents the formation of ice on the stem when medium temperatures drop below 0 °C. It is suited for universal use with valves having a stem diameter of 10 or 14 mm.



**The stem heating element heats up to 85 °C.**



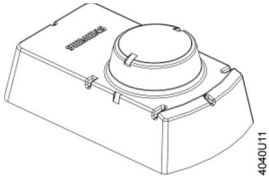
**This is a PTC element, which means it shows up with a low resistance at power up – inrush current may reach 8.5 A at low temperatures / high voltage level**

## 4.14.6 Mechanical accessories

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## Weather shield

### ASK39.1

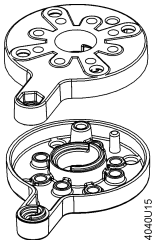


Weather shield ASK39.1 protects the actuator when installed outdoors. This does not lead to a change of IP class (IP54).

SAX61../MO is not suitable for outdoor applications

## Mounting sets

### ASK3..N



Mounting sets ASK31N, ASK33N and ASK35N enable the actuators to be fitted to slipper valves VBF21.., DN65...150 and butterfly valves VKF41.. and VKF45 (page 28-35).


## 5 Technical data

		SAY..	SAX..	SAV..	SAL..
Power supply	Operating voltage				
	SA..31..	AC 230 V ± 15 %			
	SA..61..	AC 24 V ± 20 % / DC 24 V + 20 % / -15 % (SELV)			
	SA..81..	AC 24 V ± 20 % / DC 24 V + 20 % / -15 % (SELV)			
	Frequenz	45...65Hz			
	External supply line protection (EU)	<ul style="list-style-type: none"> <li>• 6 A...10 A slow</li> <li>• Circuit breaker max. 13 A Characteristic B, C, D according to EN 60898</li> <li>• Power source with current limitation of max. 10 A</li> </ul>			
	Power consumption at 50 Hz				
	SAX31.00 Stem retracts / extends		3.5 VA / 2 W		
	SAX31.03 Stem retracts / extends		6 VA / 3.5 W		
	SAX61.03.. Stem retracts / extends		8 VA / 3.75 W		
	Holding state		3.5 VA / 1.5 W	-	-
	SAX61.03/MO Stem retracts / extends		8,7 VA / 4,25 W		
	SAX81.00.. Stem retracts / extends		3.5 VA / 2.25 W		
	SAX81.03.. Stem retracts / extends		5 VA / 3.75 W		
	SAV31.00.. Stem retracts / extends			6.5 VA / 4 W	
SAV61.00.. Stem retracts / extends		-	9.5 VA / 4.5 W	-	
SAV81.00.. Stem retracts / extends			7 VA / 4.5 W		
SAL31.00T10 Rotary actuator turns				3.5 VA / 2 W	
SAL31.00T20 Rotary actuator turns				4.5 VA / 2.75 W	
SAL31.00T40 Rotary actuator turns				7 VA / 4 W	
SAL31.03T10 Rotary actuator turns				5.5 VA / 3.25 W	
SAL61.00T10 Rotary actuator turns				5 VA / 2.5 W	
Holding state				3.5 VA / 1.5 W	
SAL61.00T20 Rotary actuator turns				6 VA / 2.75 W	
Holding state				3.5 VA / 1.5 W	
SAL61.00T40 Rotary actuator turns		-	-	9 VA / 4 W	
Holding state				3.5 VA / 1.5 W	
SAL61.03T10 Rotary actuator turns				7.5 VA / 3.5 W	
Holding state				3.5 VA / 1.5 W	
SAL81.00T10 Rotary actuator turns				3 VA / 2 W	
SAL81.00T20 Rotary actuator turns				4 VA / 2.75 W	
SAL81.00T40 Rotary actuator turns				6 VA / 3.75 W	
SAL81.03T10 Rotary actuator turns				5 VA / 3.5 W	
SAY31P03 Stem retracts / extends	6 VA / 3.5 W				
SAY61P03 Stem retracts / extends	8 VA / 3.75 W				
Holding state	3.5 VA / 1.5 W				
SAY61.03U Stem retracts / extends	8 VA / 3.75 W	-	-	-	
Holding state	3.5 VA / 1.5 W				
SAY81P03 Stem retracts / extends	5 VA / 3.75 W				
SAY81.03U Stem retracts / extends	5 VA / 3.75 W				

		SAY..	SAX..	SAV..	SAL..
<b>Function data</b>	Positioning times with specified nominal stroke / nominal angular rotation SAX..00, SAV.., SAL..00		120 s	120 s	120 s
	SAY..03, SAX..03.., SAL..03	30 s	30 s	-	30 s
	Positioning force Torque SAL..T10 SAL..T20 <sup>4)</sup> SAL..T40 <sup>4)</sup>	200 N	800 N	1600 N	- 10 Nm running 20 Nm running 40 Nm running
	Nominal stroke	15 mm	20 mm	40 mm	-
	Angular rotation				90°
<b>Signal inputs</b>	Positioning signal "Y" SA..31.., SA..81..	3- position			
	SA..31.. Voltage	AC 230 V ± 15 %			
	SA..81.. Voltage	AC 24 V ± 20 % / DC 24 V + 20 % / -15%			
	SA..61.. (DC 0...10 V) Current draw Input impedance	≤ 0,1 mA ≥ 100 kΩ			
	SA..61.. (DC 4...20 mA) Current draw Input impedance	DC 4...20 mA ± 1 % ≤ 500 Ω			
<b>Communication</b>	<b>Communications protocol</b>				
	Modbus RTU	RS-485, not galvanically separated			
	Number of nodes	Max. 32			
	Address range	1...247 / 255 Factory settings: 255			
	Transmission formats	1-8-E-1 / 1-8-O-1 / 1-8-N-1 / 1-8-N-2 Factory settings: 1-8-E-1			
	Baud rates (kBaud)	Auto / 9.6 / 19.2 / 38.4 / 57.6 / 76.8 / 115.2 Factory settings: Auto			
	Bus termination	120 Ω electronically switchable Factory settings: Off			
<b>Parallel operation</b>	SA..61..	≤ 10 (depending on controller output)			
<b>Forced control</b>	Positioning signal "Z"				
	SA..61.. R = 0...1000 Ω	R= 0...1000 Ω, G, G0 Stroke / rotation proportional to R			
	Z connected to G	Max. stroke 100% <sup>1)</sup>			
	Z connected to G0	Min. stroke 0% <sup>1)</sup>			
	Voltage	Max. AC 24 V ± 20 % Max. DC 24 V + 20 % / -15%			
	Current draw	≤ 0,1 mA			
<b>Position feedback</b>	Position feedback U SA..61..	DC 0...10 V			
	Load impedance	>10 kΩ res.			
	Load	Max. 1 mA			
<b>Connecting cable</b>	Wire cross-sectional areas	0.13...1.5 mm <sup>2</sup> , AWG 24...16 <sup>2)</sup>			
	Cable entries SA..	EU: 2 entries Ø 20.5 mm (for M20) 1 entry Ø 25.5 mm (for M25)			
	SA..U SAX61../MO	US: 3 entries Ø 21.5 mm for ½" tube connection Fixed connecting cable: 0.9 m Number of wires: 5 x 0.75 mm <sup>2</sup>			
<b>Degree of protection</b>	Housing from vertical to horizontal	IP54 as per EN 60529 3)			
	Insulation class Actuators SA..31..   AC 230 V Actuators SA..61..   AC / DC 24 V Actuators SA..81..   AC / DC 24 V	As per EN 60730 II III III			

		SAY..	SAX..	SAV..	SAL..
Environmental conditions	Operation	IEC 60721-3-3			
	Climatic conditions	Class 3K5			
	Mounting location	Indoors (weather-protected) <sup>6)</sup>			
	Temperature General	-15...55 °C			
	Humidity (noncondensing)	5...95 % r.h.			
	Transport	IEC 60721-3-2			
	Climatic conditions	Class 2K3			
	Temperature	-25...70 °C			
	Humidity	<95 % r.h.			
	Storage	IEC 60721-3-1			
	Climatic conditions	Class 1K3			
	Temperature	-15...55 °C			
	Humidity	5...95 % r.h.			
	Max. media temperatur when mounted on valve	130 °C	130 °C	130 °C <sup>5)</sup>	120 °C

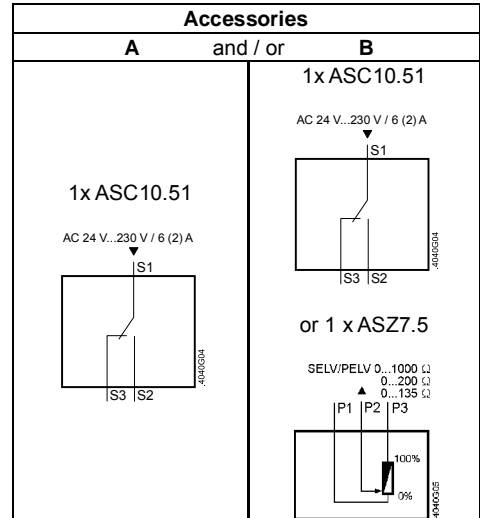
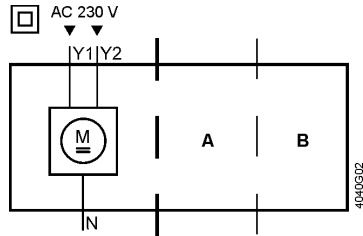
		SAY..	SAX..	SAV..	SAL..
Directives and Standards	Product standard	EN60730-x			
	Electromagnetic compatibility (Application)	For residential, commercial and industrial environments			
	EU Conformity (CE)	A5W00000333 <sup>1)</sup>	CE1T4501x1 <sup>7)</sup>	CE1T4503xx <sup>7)</sup>	CE1T4502X1 <sup>7)</sup>
	RCM Conformity AC 230 V EAC Conformity	A5W00000334 <sup>1)</sup>	CE1T4515X4 <sup>7)</sup>	CM1T4503_C1 <sup>7)</sup>	-
	Eurasia conformity for all SA...-variants				
	UL, cUL	AC 230 V AC/DC 24 V	- UL 873 <a href="http://ul.com/database">http://ul.com/database</a>		
Environmental compatibility		The product environmental declarations contain data on environmentally compatible product designs and assessments (RoHS compliance, materials composition, packaging, environmental benefit, disposal):			
		7173310559Ben <sup>7)</sup>	7173310559Ben <sup>7)</sup> A6V101083254 <sup>7)</sup>	7173310522A <sup>7)</sup>	CE1E4502en <sup>7)</sup>
Dimensions		See "Dimensions" (page 84)			
Weight	Excl. packaging	See "Dimensions" (page 84)			
Accessories <sup>8)</sup>	Potentiometer ASZ7.5	0...1000 Ω ± 5%			
	Voltage	DC 10 V (SELV)			
	Current rating	< 4 mA			
	Auxiliary switch ASC10.51	AC 24...230 V, 6 (2) A, floating			
	Switching capacity	See section power supply			
	External supply line protection US installation, UL & cUL	AC 24 V class 2, 5 A general purpose			
Stem heating element ASZ6.6	AC / DC 24 V ± 20 %				
Power supply	50 VA / 30 W				
Power consumption at 50 Hz	Max. 8.5 A (max. Temperatur 85 °C / 185 F)				
Inrush current (cold)					
Function module AZX61.1 for SA..61..					
Switching capacity	AC 24...230 V, 6 (2) A, floating				
External supply line protection	See section power supply				
US installation, UL & cUL	AC 24 V class 2, 5 A general purpose				

- 1) Observe acting direction of DIL switches
- 2) AWG = American wire gauge
- 3) Also with weather shield ASK39.1
- 4) SAL.T20 / T40 have a minimum holding torque of 14 Nm
- 5) Up to 150 °C with horizontal mounting position
- 6) SAX61../MO is not suitable for outdoor applications.
- 7) The documents can be downloaded from <http://siemens.com/bt/download>.
- 8) UL recognized component 

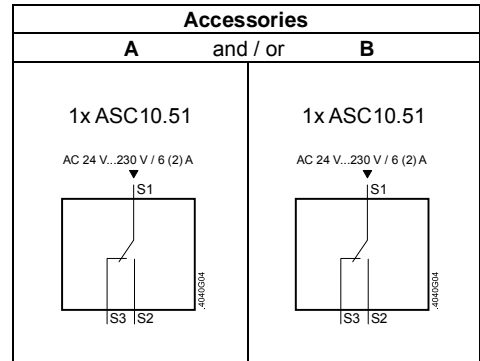
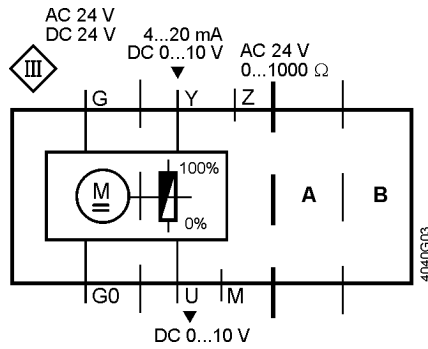
# 6 Connection diagrams and dimensions

## 6.1 Internal diagrams

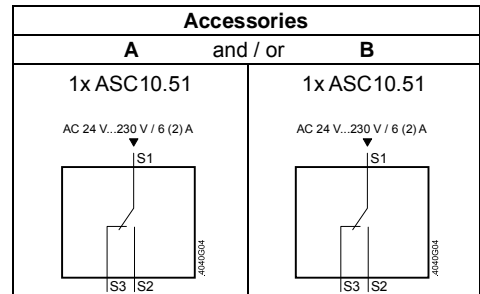
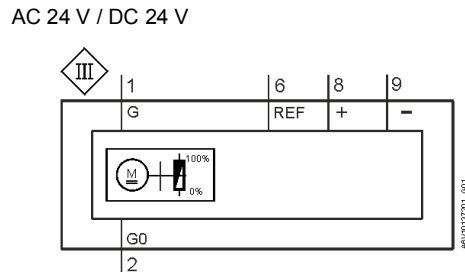
SA..31..



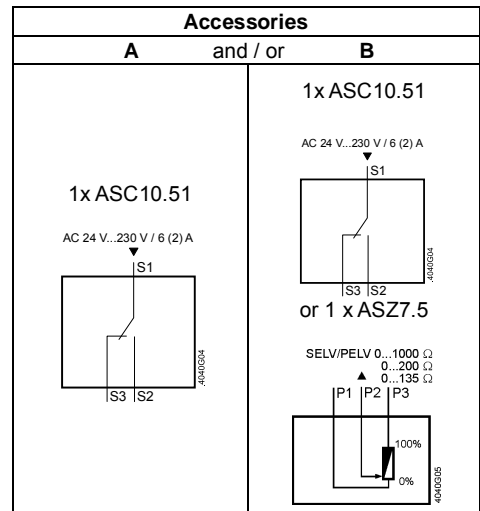
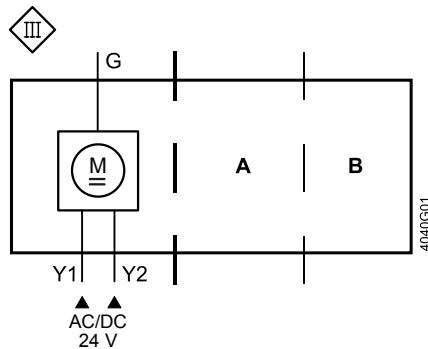
SA..61..



SAX61../MO



SA..81..





## 6.2 Connection terminals

### 6.2.1 Actuators

#### SA..31..

AC 230 V, 3-position

N	System neutral (SN)
Y1	Positioning signal (actuator's stem extends / actuator's spindle turns clockwise)
Y2	Positioning signal (actuator's stem retracts / actuator's spindle turns counter-clockwise)

#### SA..61..

AC/DC 24 V, DC 0...10 V / 4...20 mA / 0...1000 Ω

G0	System neutral (SN)
G	System potential (SP)
Y	Positioning signal for DC 0...10 V / 4...20 mA
M	Measuring neutral
U	Position feedback DC 0...10 V - (reference potential is M measuring neutral)
Z	Positioning signal forced control AC/DC ≤ 24 V, 0...1000 Ω

#### SAX61../MO

Fixed connecting cable  
5 x 0.75 mm<sup>2</sup>

AC/DC 24 V, Modbus RTU connection cable

G0	System neutral (SN)	black
G	System potential (SP) AC 24 V ~ / DC 24 V =	red
REF	Reference (Modbus RTU)	violet
+	Bus + (Modbus RTU)	grey
-	Bus - (Modbus RTU)	pink

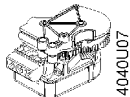
#### SA..81..

AC/DC 24 V, 3-position

G	System potential (SP)
Y1	Positioning signal (actuator's stem extends / actuator's spindle turns clockwise)
Y2	Positioning signal (actuator's stem retracts / actuator's spindle turns counter-clockwise)

### 6.2.2 Electrical accessories

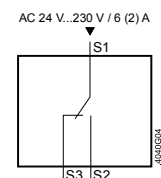
#### Auxiliary switch ASC10.51



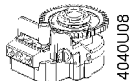
Adjustable switching points, AC 24...230 V

1	System potential (SP)
2	Closing Contact
3	Opening Contact

Switching state always related to extending actuator stem or clockwise turning actuator's spindle turns



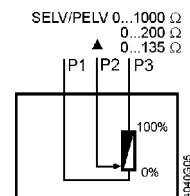
#### Potentiometer ASZ7.5



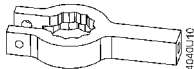
Adjustment of zero point, DC 10 V

1	Measuring neutral
2	0...x Ω
3	x...0 Ω

x = 135 Ω, 200 Ω; 1000 Ω



#### Stem heating element ASZ6.6

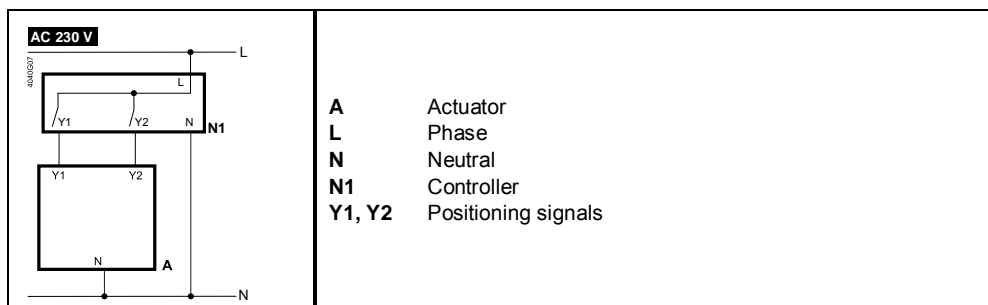


AC/DC 24 V / 30 W / 50 VA / inrush current max. 8.5 A

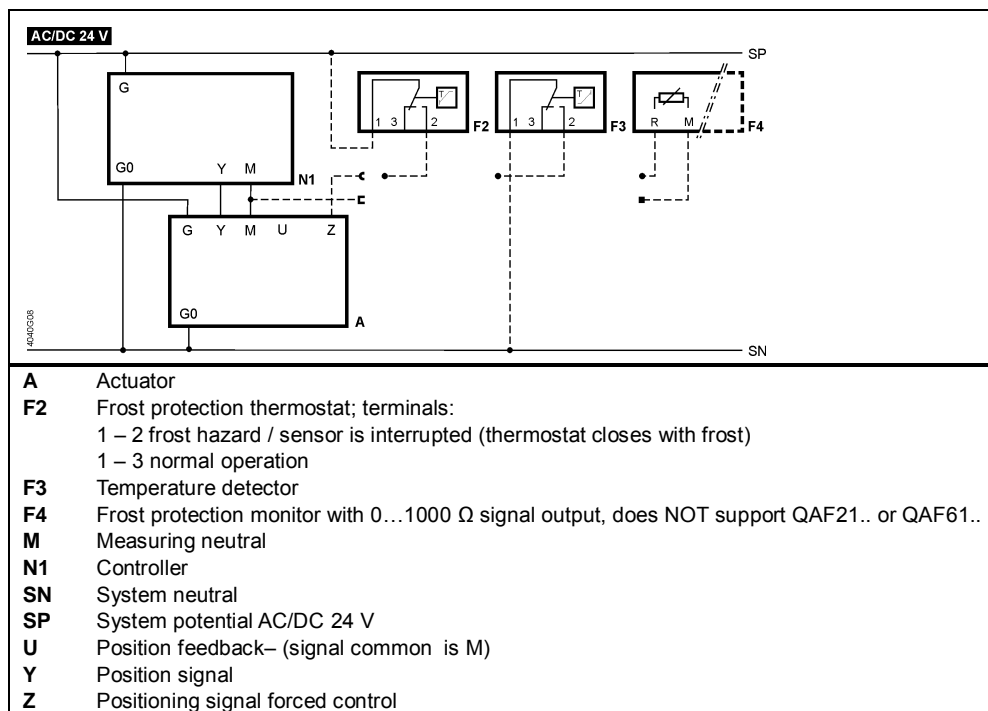
1	System neutral (SN) (red)
2	System potential (SP) (black)

## 6.3 Connection diagrams

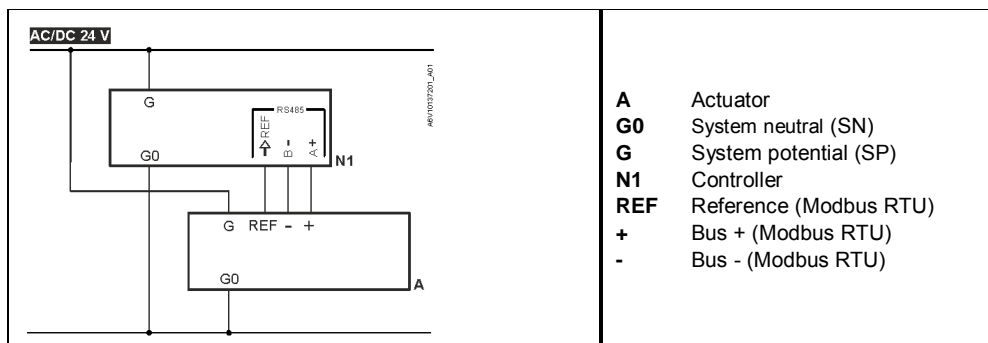
SA..31..



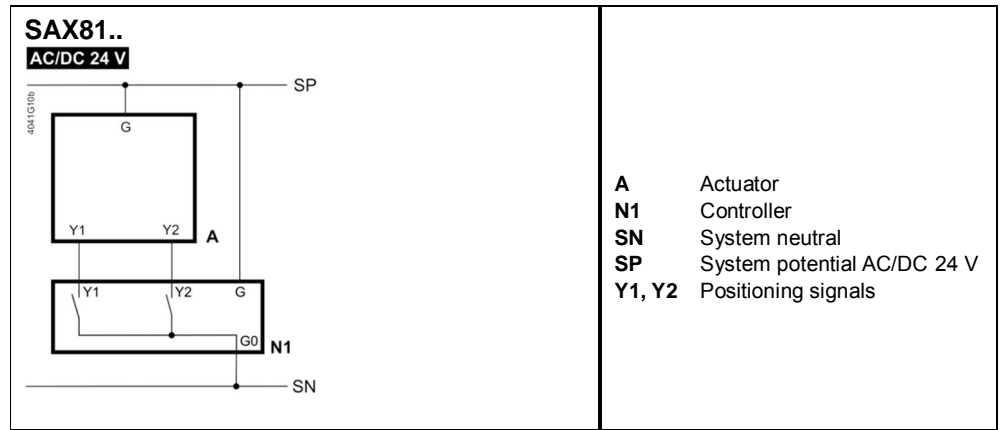
SA..61..



SAX61../MO

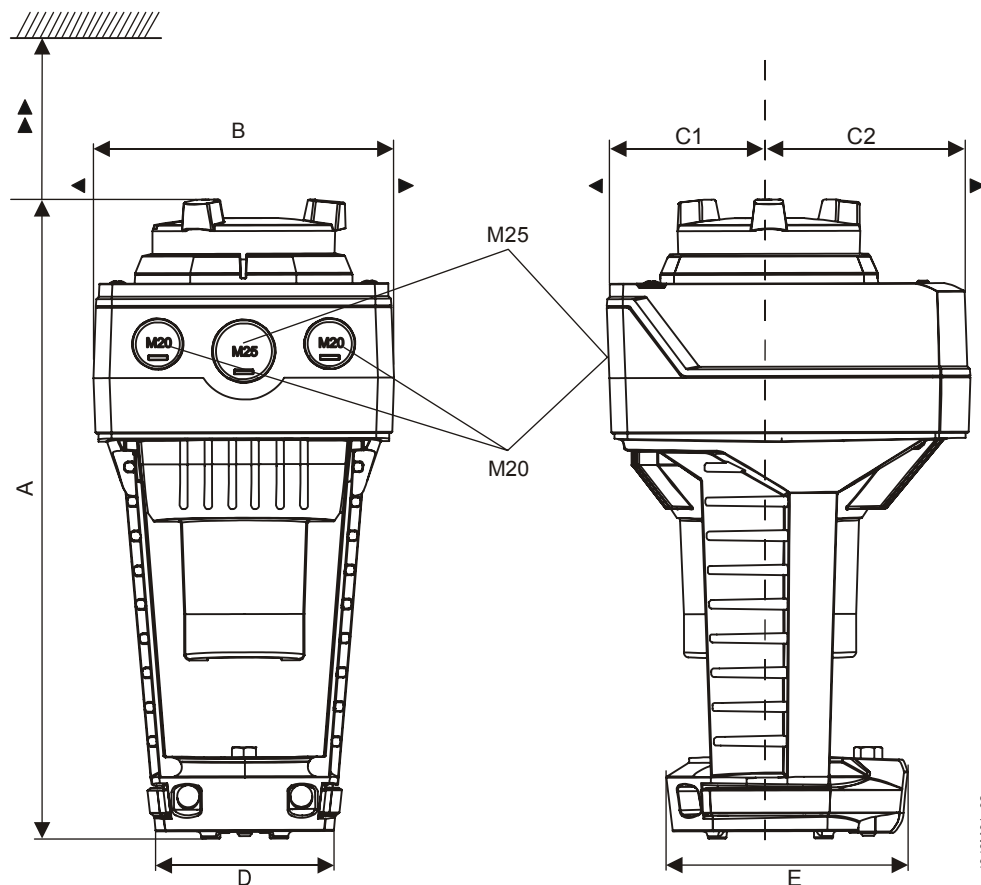


SA..81..



## 6.4 Dimensions

### 6.4.1 Stroke actuators



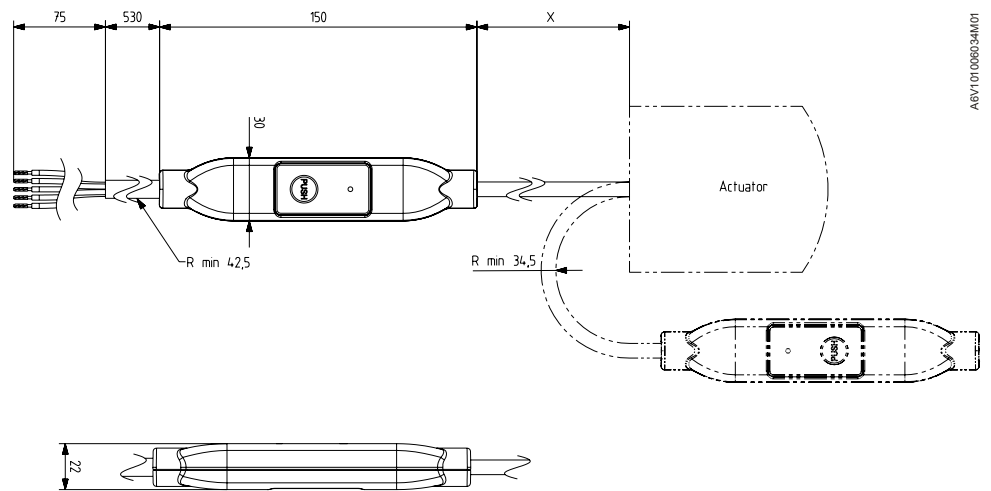
- 1 SAX../SAV.: M25  
 SAX..U/SAV..U: ½" (Ø 21.5 mm)  
 2 SAX../SAV.: M20  
 SAX..U/SAV..U: ½" (Ø 21.5 mm)


Type	A	B	C	C1	C2	D	E	▶	▶▶	kg
SAX.. (U <sup>1)</sup> )	242	124	150	68	82	80	100	100	200	1.780
SAX../MO <sup>3)</sup>										1.930
Mit ASK39.1	+25	154	300	200	100	-	-	-	-	2.010
SAV.. (U <sup>1)</sup> )	265	124	150	68	82	80	100	100	200	1.920
Mit ASK39.1	+25	154	300	200	100	-	-	-	-	2.150
SAY.. (U <sup>1)</sup> )	242	124	150	68	82	80	100	100	200	1.780

- 1) SAX..U: 1.850 kg  
 2) SAY..U: 1.850 kg  
 3) Device equipped with a fixed connection cable – Left cable entry is used

Dimensions in mm

## 6.4.2 External Modbus converter

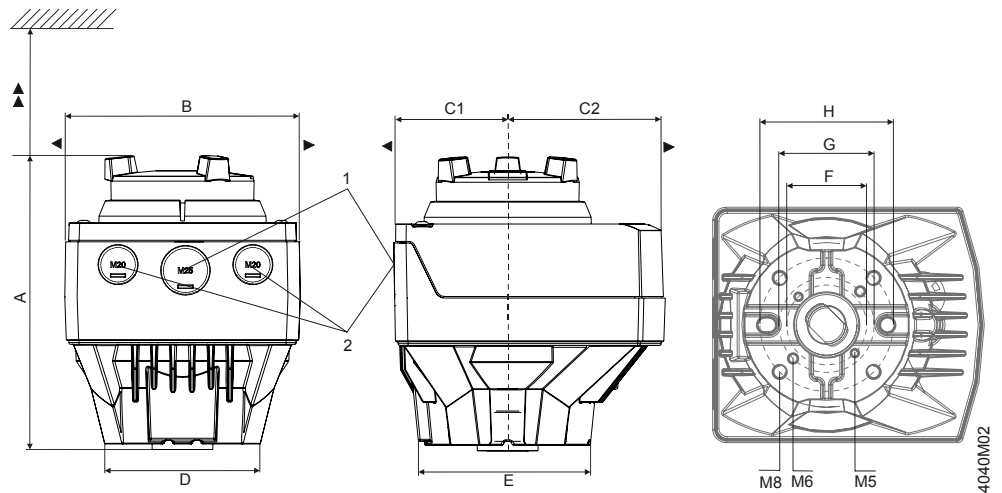


Type	X [mm]	 [kg]
<b>SAX../MO</b>	250	0.15 <sup>1)</sup>

<sup>1)</sup> Already included in total weight

Dimensions in mm

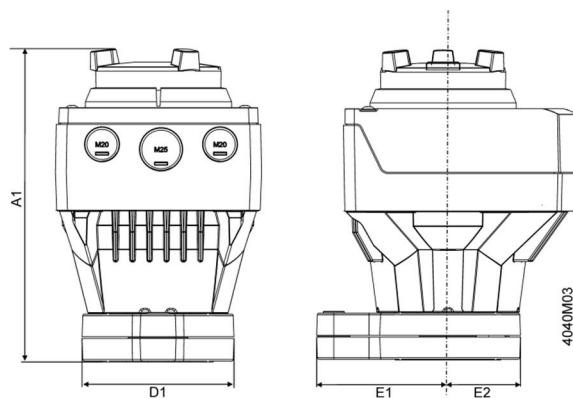
### 6.4.3 Rotary actuators



- 1 SAL...: M25
- 2 SAL...: M20

Typ	A	B	C	C1	C2	D	E	F	G	H	▶	▶▶	kg		
													SAL..T10	SAL..T20	SAL..T40
SAL..	160	124	150	68	82	82	88	42	50	70	100	200	1.475	1.600	1.625
With ASK39.1	+25	154	300	200	100	-	-	-	-	-	-	-	1.710	1.835	1.860

#### With mounting set ASK3..N



Type	A1	D1	E1	E2
SAL.. with ASK3..N	188	88	80	44
With ASK39.1	+25	-	-	-

Dimensions in mm

## 7 Revision numbers

Product no.	Valid from rev. no.	Product no.	Valid from rev. no.
SAX31.00	..H	SAL31.00T10	..E
SAX31.03	..H	SAL31.00T20	..D
SAX31P03	..H	SAL31.00T40	..B
SAX81.00	..H	SAL31.03T10	..E
SAX81.03	..H	SAL61.00T10	..E
SAX81.03U	..H	SAL61.00T20	..D
SAX81P03	..H	SAL81.00T40	..B
SAX61.03	..H	SAL61.03T10	..E
SAX61.03U	..H	SAL81.00T10	..E
SAX61P03	..H	SAL81.00T20	..D
SAX61.03/MO	..H	SAL81.00T40	..B
		SAL81.03T10	..E
SAV31.00	..B		
SAV61.00	..B		
SAV61.00U	..B	SAY31P03	..A
SAV61P00	..B	SAY61P03	..A
SAV81.00	..B	SAY81P03	..A
SAV81.00U	..B		
SAV81P00	..B		

# 8 Glossary

## 8.1 Symbols

---



Caution, general danger – read the notes!



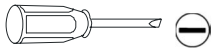
Caution, hot surface – read the notes!



Condition as supplied to customer



Crosstip screwdriver (Pozidriv)



Slotted screwdriver



Screw wrench



Allen key

## 8.2 Terms

---

### **Climatix™**

The complete product range of flexible and scalable control solutions, standardized up to and including freely programmable solutions. Specialized for HVAC applications.

### **DIL switches**

A DIL switch shows the switching choices in the form of a place value system (dual in line) in relation to basis 2 (on and off).

### **DN**

Nominal size: Characteristic for matching parts of the piping system.

### **Forced control**

Forced control serves for overriding automatic mode and is implemented in the structure.

### **HEX switches**

A HEX switch shows the switching choices in the form of a place value system (hexadecimal system) in relation to basis 16 (0...9 and A...F).

### **kPa**

Unit of pressure: 100 kPa = 1 bar = 10 mWS.

### **$k_{vs}$**

Nominal flow rate: Nominal flow rate of cold water (5...30 °C) through the fully open valve ( $H_{100}$ ) at a differential pressure of 100 kPa (1 bar).

### **LED**

Light emitting diode.

### **Modbus RTU**

Open communications protocol (client/server architecture), transmits data as binary data.

RTU: Remote Terminal Unit.

### **PN**

PN class: Characteristic relating to the combination of mechanical and dimensional properties of a component in the piping system.

### **Position feedback**

Signal used to acquire the position, fed back via an input.

### **Spring return facility**

Refer "fail safe function".



$\Delta p_{\max} / \Delta p_{\max V}$

Maximum permissible differential pressure across the valve's control path, valid for the entire actuating range of the motorized valve (V = diverting mode).

$\Delta p_s$

Maximum permissible differential pressure at which the motorized valve will close securely against the pressure (close off pressure).

**slotted screwdriver**

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